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MILES TRAINING AND EVALUATION TEST, USAREUR: BATTALION COMMAND GROUP TRAINING

Herbert F. Barber and Robert E. Solick

ARI FIELD UNIT AT FORT LEAVENWORTH, KANSAS

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Commander

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The Multiple Integrated Laser Engagement System (MILES) Training and Evaluation Test was designed to address multiple objectives concerning improved methodology for unit training and evaluation for echelons from squad to battalion. This research effort focused on command post exercises (CPX) using the Computer Assisted Map Maneuver System (CAMMS) and the feasibility of integrating CPX and field exercise techniques using CAMMS and the MILES.

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MILES TRAINING AND EVALUATION TEST, USAREUR: BATTALION COMMAND GROUP TRAINING

Herbert F. Barber and Robert E. Solick

Submitted by:
Robert S. Andrews, Chief
ARI FIELD UNIT AT FORT LEAVENWORTH, KANSAS

Approved by:

Edgar M. Johnson, Director
ORGANIZATIONS AND SYSTEMS
RESEARCH LABORATORY

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
5001 Eisenhower Avenue, Alexandria, Virginia 22333

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Battle Simulations for
Command Training

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FOREWORD

The Fort Leavenworth, Kans., Field Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) conducts a research program in support of the Combined Arms Center (CAC), which includes the Combined Arms Training Developments Activity (CATRADA), the Combined Arms Combat Developments Activity (CACDA), and the Command and General Staff College (CGSC).

The CATRADA-related efforts encompass the identification of critical command group performance requirements at battalion, brigade, and division levels; the development of procedures for measuring command group performance; the development of procedures for measuring the training effectiveness of battle simulations; and the development of specifications for more effective command and control training systems through experimentation with current simulations.

The present investigation was performed with two major training technologies: battle simulation (BS) and engagement simulation (ES). In the near future, these approaches will become available to U.S. Army Forces Command (FORSCOM) units at their home station and at the National Training Center. The MILES Training and Evaluation Test, U.S. Army, Europe (USAREUR), provided an opportunity to gather data about the feasibility and utility of using BS, specifically the Computer Assisted Map Maneuver System (CAMMS), and ES, specifically the Multiple Integrated Laser Engagement System (MILES), separately and in combination to train a battalion-size unit. This report describes the training provided to the battalion command group/staff during the test and the feasibility and utility of various training configurations. This investigation is responsive to the objectives of Army Project 2Q263744A795, concerned with the improvement of command and control training methods and systems.

LTC Larry P. McDonald and the staff of the Computer Support Simulations Division of the Battle Simulations Directorate, CATRADA, were instrumental in the development and conduct of this research. The 85th Maneuver Training Command, Fort Sheridan, Ill., also contributed to the development of the diagnostic feedback portion of the training effort.

JOSEPH ZEIDNER
Technical Director

MILES TRAINING AND EVALUATION TEST, USAREUR:
BATTALION COMMAND GROUP TRAINING

BRIEF

Requirement:

To improve the utility of battle simulation and engagement simulation technology in command and control (C^2) training at battalion level.

Procedure:

Two battalion simulation exercises were conducted with an armor battalion command group/staff using the Computer Assisted Map Maneuver System (CAMMS) and a specially developed diagnostic feedback package. Subsequently, two integrated exercises were conducted in which the battalion command group/staff received C^2 training with CAMMS while interfacing with one company team conducting field training against a live opposing force using the Multiple Integrated Laser Engagement Simulator (MILES) equipment and procedures. Detailed performance ratings and the perceptions of the players and controllers concerning realism and training value were collected for each exercise.

Findings:

The CAMMS controller training course, which includes the associated manuals and training on how to complete data forms and interpret computer printouts, was judged to be satisfactory. The diagnostic feedback procedures were generally perceived to be a useful addition to the CAMMS training program. However, some suggested improvements and modifications were identified. The integrated training was judged to be satisfactory in most areas; however, CAMMS was the training environment preferred by the command group/staff. Problems associated with gathering/reporting information to the control center and the control/coordination required to synchronize the battle simulation with the engagement simulation events were identified.

Utilization of Findings:

The suggestions for improving controller training for CAMMS have been provided to the training developers. An improved diagnostic feedback package is being developed to provide to the CAMMS developers. The National Training Center development team have been provided with the findings of the integrated exercises for incorporation into their planning.

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EXECUTIVE SUMMARY

Requirement:

The Multiple Integrated Laser Engagement System (MILES) Training and Evaluation Test, U.S. Army, Europe (USAREUR), was designed to address multiple objectives concerning improved methods for unit training and evaluation for echelons from squad to battalion. The battalion command group component of the test dealt with two subsets of these objectives: (a) command post training using the Computer Assisted Map Maneuver System (CAMMS) and (b) simultaneous command post and field exercises using the technology of CAMMS and the MILES, respectively. Test events related to these objectives are labeled the command group training and the integrated training portions of the test, respectively.

The command group training portion of the test was designed to train the battalion command group/staff on subtasks derived from the Army Training and Evaluation Program for Mechanized Infantry/Tank Task Force (ARTEP 71-2). This was intended both to train the command group/staff for later participation in integrated and battalion field exercises and to establish a baseline for comparison among command post, integrated, and field exercises. In addition, there were three research objectives in this portion of the test:

- To investigate the ability of a newly formed CAMMS control team to implement CAMMS exercises after receiving the standard CAMMS controller training course;
- To collect data on the implementability and utility of a diagnostic feedback package that interprets and applies the ARTEP concept for command group/staff training to the battle simulation environment; and
- To compare the relative ability of the CAMMS control team and a team of evaluators to diagnose training deficiencies and to provide feedback to the command group/staff.

All three objectives deal with the personnel, manuals, forms, procedures, and programs of instruction required to fully utilize a simulation-based command and control training system in fulfilling ARTEP objectives.

The integrated training portion of the test examined the feasibility of combining command post and field exercises in simultaneous multiechelon training using CAMMS to drive the command post exercises (CPX) and MILES to structure the field training exercises (FTX). The concept is of interest for two reasons. First, the increased range and mobility of modern weapon systems and corresponding changes in tactical doctrine have expanded the required physical dimensions of training areas for training at all echelons, whereas environmental and budgeting constraints preclude the acquisition of additional real estate to meet the increased need. The demand for training space can be reduced by giving lower echelons field training in rotation while simulating adjacent maneuver units. Second, multiechelon training is a way to compress the time

required for training, since time at the major training areas is also at a premium. The integrated training concept has the potential for exercising the command group/staff in command and control functions while simultaneously training lower echelons in field problems; an additional benefit is that interfaces between the echelons are more completely represented than in a typical FTX. Two primary research objectives were addressed in the feasibility test:

- To develop control structures and information-handling procedures necessary to integrate battle simulations with tactical engagement simulations; and

- To identify the enhancements and degradations in training resulting from an integrated training system compared to separate CAMMS and MILES exercises.

Procedure:

Two CAMMS exercises and two integrated exercises were conducted with the same battalion command group/staff. Performance measures based on ARTEP 71-2 were gathered during each exercise to determine how well the diagnostic feedback procedures could be implemented in each training environment. However, lack of a comparison group precluded use of these measures as indicators of the adequacy of the training, so the primary research data consisted of the participants', controllers', and evaluators' responses to detailed questionnaires. The questionnaires dealt with (a) the clarity, completeness, and utility of the manuals, instructions, forms, and procedures used during the CAMMS exercises; (b) the information and control procedures used during the integrated exercises; and (c) the perceived realism and training value of each exercise.

The command group training exercises consisted of a covering force mission over terrain in the Frankfurt, Germany, area and an attack mission over terrain in the Kastellaun, Germany, area, where the test was being conducted. The first exercise was chosen to be as similar as possible to the type of exercise most likely to be conducted by a newly trained control team using the CAMMS system so that the adequacy of the controller training course, given just prior to the exercise, could be determined. Hence, the mission and terrain were taken from the defensive scenario distributed with the CAMMS kit. In addition, the performance diagnosis and feedback sessions were handled by the control team augmented by one observer located in the command group's tactical operations center (TOC), since these functions are typically performed that way in a CAMMS training exercise.

The second exercise was constructed to be similar to the integrated exercises in order to establish a baseline for comparison. An external evaluation team diagnosed command group performance and provided feedback for this exercise and the subsequent integrated exercises. The reaction of the controllers and evaluators to the diagnostic and feedback tasks and the reaction of the command group to the information provided by each group permitted an initial evaluation of the diagnostic feedback package and generated data on the personnel requirements for training/readiness evaluation.

The two integrated training exercises were both attack missions on local terrain. In each case, a battalion command group/staff CPXing with CAMMS interfaced with one company team FTXing against a live opposing force using MILES equipment and procedures. The CAMMS system simulated "adjacent" notional companies; kept records of equipment and personnel for both live and notional elements; and determined direct fire, TAC air, and indirect fire casualties for the notional battle. The two integrated exercises differed principally in the procedures they used for gathering information from the field and reporting it to the exercise control center and in procedures used for controlling and integrating the actions of the live and notional opposing forces.

Findings:

1. Command Group Training.

a. Controller Training Course. CAMMS has been in the field for several years, so it was not anticipated that many major adjustments would be needed in the hand-off package associated with the system. The responses of the controllers, including the computer terminal operators, supported that prediction. In general, the controller training course, which includes the associated manuals and training on how to complete the CAMMS data forms and interpret the computer printouts, was judged to be sufficient and satisfactory. On the other hand, several respondents felt that the "mini-exercise" portion of the course could be improved by shortening it and by including the battalion command group/staff in the trial run. This would allow the controllers to practice the role-playing aspect of their duties in addition to the mechanical skills related to interfacing with the computer and with the terrain board. The questionnaire responses and controller comments suggest further that the current mix of lecture presentation and practical exercise be shifted more toward the demonstration and hands-on experience side. Finally, several controllers felt that more personnel were needed to represent higher and adjacent echelons of the organization and to represent additional resources.

b. Diagnostic and Feedback Procedures. The diagnostic and feedback procedures were generally perceived to be a useful addition to the CAMMS training exercise, with 83% of the respondents recommending their inclusion in the CAMMS package. However, most felt that revisions were necessary. There were basically two recommendations: (a) reduce the length of the instructions and (b) change the format so that each functional area being observed, each mission, and each unit type is represented by a separate packet of subtasks and associated observable events. The feedback procedures were well received by the players, controllers, and evaluators; the only major problem in their implementation was a lack of time to prepare and conduct the sessions at the end of the execution phase of the exercise.

c. Controllers as Evaluators. The controllers felt that they had little opportunity to observe command group performance. In contrast, the evaluators felt that they had extensive opportunity to observe and placed more confidence in their ratings of performance than did the controllers. Two-thirds of the controllers reported that the observation/rating requirements interfered with their controller duties at least some of the time during the exercise. Finally, all but one of the controllers recommended that controllers not be used as observers/evaluators, with the dissenter indicating that this should occur only if there is a shortage of trained personnel.

In general, the controllers did not feel comfortable or confident, nor did they perceive that they gave accurate and valuable feedback to the players. The command group participants, when asked to rate feedback, tended to rate the feedback received from controllers after the first exercise as less accurate and less valuable than that received from evaluators after the second CAMMS exercise. The practice of having one TOC observer augment the control team appears not to be sufficient for training diagnosis.

2. Integrated Training.

a. Perceived Training Benefit. In general, the integrated training was judged to be satisfactory in most areas; however, CAMMS was the preferred training environment for the command group/staff. Several problems occurred in the first integrated exercise, particularly in the area of gathering control information and reporting it to the exercise control center. The system was modified prior to the second integrated exercise, reducing the information flow problem, though some control problems persisted. After the second exercise, all but one of the participants agreed that the integrated format should be used in future training exercises; however, a minority felt that "some" or "extensive" revision was needed.

b. Information Flow. The integrated training format depends heavily on high-quality FM communications on the operational side among the battalion tactical operations center, combat trains, and company in the field and on the control side among the exercise control center, field controllers, and the opposing force in the field. In addition, successful integration requires that timely and accurate information is gathered in the field, then summarized and transmitted to the exercise control center, with control information being passed from the exercise control center to the field. The prototype integrated system was successful in establishing the necessary communication links and information processing procedures but the information flow was not timely, particularly in the first integrated exercise. Revised reporting procedures implemented in the second exercise eliminated a major source of delay, but a shortage of field controllers prevented any substantial improvement in the information-gathering process.

c. Control/Coordination. The controllers had three primary means of managing the integrated exercise: through scenario development, control of the opposing force, and the higher headquarters of the unit being tained (simulated by the exercise controllers). The main purpose of the control effort was to retain live-on-live and notional-on-notional conflicts. This was difficult to do during the implementation at the battalion level because of the highly interdependent use of company-size units. Despite careful selection of the mission, training land, and opposing force course of action (scenario control), the live and notional forces became mixed on the control board during the first integrated exercise. It also became apparent that the live opposing force would have to respond to suppressive fire from notional friendly companies and would have to anticipate use of the live friendly company so as to move to the indicated locations rapidly enough to maintain the live conflict. Additional control links from the exercise control center to the field controller were added during the second exercise to inform the elements in the field of the state of the notional battle. Although the control mechanisms improved during the second exercise, military observers in the control team and the test directorate indicated that the integrated concept would be of greater potential benefit if

employed at the brigade level, where mixing of live and notional forces could be prevented by assignment of battalion zones.

Utilization of Findings:

1. Command Group Training.

a. Controller Training Course. The results of this test indicate that methods to increase the amount of hands-on training for the control team should be explored. This should include practice in role playing during the mini-exercise. The comments and suggestions made by the controllers concerning additional personnel are presently addressed in the CAMMS control manuals. Any decisions concerning increased personnel rest on the unit supporting the training. Suggestions for improvements in the CAMMS system have been passed on to the developers of the system for incorporation into the refined and expanded CAMMS being developed.

b. Diagnostic and Feedback Procedures. The diagnostic feedback package is being revised in accordance with the findings of the test. Revisions include: (a) dividing the instructions into parts and addressing them to specific members of the evaluation team; (b) tagging the subtasks and associated events according to the specific mission, unit type, and staff area to which they apply; and (c) modifying the feedback procedures to increase the involvement of company commanders. Methods are being explored to reduce the burden of the diagnostic effort and to improve the training associated with diagnosis and feedback. An audiovisual aid is being considered for the latter purpose. Color-coding of forms and direct entry of ratings into the computer system are being explored as ways to reduce preparation time for the feedback sessions.

c. Controllers as Evaluators. Since it is unlikely that the number of personnel devoted to diagnosis can be significantly increased in a training situation, methods are being explored to increase the opportunities of the control team to observe the command group and to make better use of the historical record of the exercise maintained by the computer system for training diagnosis.

2. Integrated Training.

The stimulus to considering the integration of a battle simulation with a tactical engagement simulation was the desire for optimal use of facilities at the new National Training Center (NTC) at Fort Irwin, Calif. NTC is designed to provide unit training in all tactical skills through the battalion level. A utilization concept that involves simultaneous use of facilities by several battalions in different stages of their training cycle was proposed for NTC. A natural extension of this concept is to train by brigade, permitting the brigade staff to CPX with the battalion staffs of those units undergoing small unit training, and simultaneously to direct the activities of a unit involved in a battalion task force field exercise. The decision to examine the concept at battalion level in this test was mandated by the fact that brigade and battalion command/staff participants and division-level controllers and evaluators could not be devoted to test activities for the necessary length of time. However, the findings of this test and of the concept analysis that preceded it have clear implications for the information and control requirements and expected training benefits of integration at the brigade level.

OVERVIEW

The U.S. Army has several ongoing developmental efforts designed to improve the efficiency and the effectiveness of training. These efforts are designed to assist and guide units in fulfilling their training responsibilities and needs. Training developments of particular interest are tactical engagement simulations (TES) and battle simulations (BS). Tactical engagement simulations are field maneuver systems that simulate direct-fire weapons effect and signature using number recognition or laser sensor techniques for casualty assessment. Battle simulations are map or terrain board maneuver systems designed to train unit leaders and members of their staff using gaming and computer technology. The Army Training and Evaluation Program (ARTEP) is being fielded to provide guidelines and structures to help the training manager plan and conduct training using the new systems.

The Multiple Integrated Laser Engagement System (MILES) Training and Evaluation Test, U.S. Army, Europe (USAREUR), was designed to address multiple objectives concerning improved methods for tactical training and evaluation of combat arms units, from squad to battalion. In particular, both TES and BS were examined in the test. TES was represented by the MILES, and BS by both the Computer Assisted Map Maneuver System (CAMMS) and the Battalion Analyzer and Tactical Trainer for Local Engagement (BATTLE). All of these systems will be available to the Army training manager for implementation of ARTEP-guided training plans. This report deals only with the MILES and CAMMS systems in the light of their utility for battalion-level training. BATTLE and MILES for company teams and smaller units are treated in a separate report.

The test provided a unique opportunity to observe and assess the various training configurations that could be developed by looking at CAMMS alone or in combination with MILES within the framework of the Army Training and Evaluation Program for Mechanized Infantry/Tank Task Force (ARTEP 71-2). At the same time, this test provided a chance to explore refinements and additions to current battle simulation technology being developed by the Army.

Three training environments/configurations that appeared to have potential for enhancing the training benefit for command group/staff were proposed. The first environment consisted of the CAMMS training package augmented by a diagnostic feedback package developed at Fort Leavenworth, Kans. Simultaneously, the controllers' and evaluators' requirements for implementation of the CAMMS system would be examined. The second training environment consisted of an integration of the CAMMS battle simulation technology with the tactical engagement simulation technology of MILES. It involved the simultaneous training of the battalion command group using the CAMMS system and one of the battalion's companies using MILES in the field. Since this configuration involved mixing battle simulation and engagement simulation, it is called an integrated exercise. The final training environment consisted of the entire battalion task force participating in a MILES field exercise with the CAMMS technology used to control the exercise. This can be conceptualized as a special type of field training exercise (FTX).

Opinions and feedback were solicited from individuals involved in the test. Comparisons of these responses provided insights into the advantages and disadvantages of the various training configurations. Five exercises were proposed so that various training configurations could be tried out. Figure 1 shows

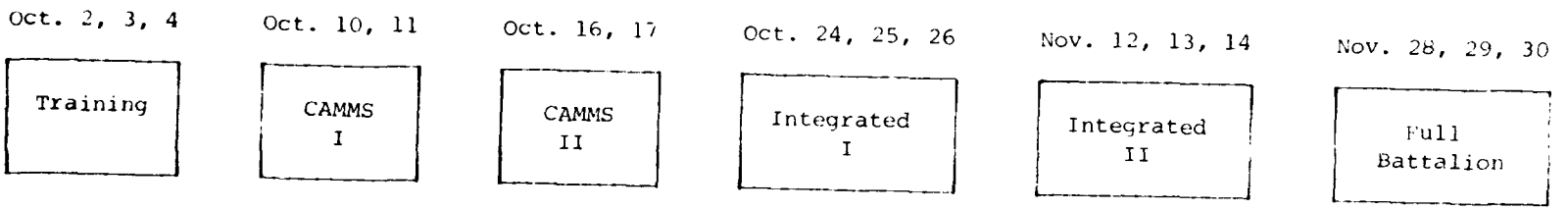

Figure 1. Battalion command and control event schedule.

the original schedule of the exercises. The first two exercises augmented the CAMMS system with differing diagnostic and feedback approaches, the second two exercises tested an integrated format, and the final exercise used the MILES and CAMMS technologies in an FTX configuration. The final training environment did not occur as had been planned. While a battalion field exercise was conducted, different controllers and observers were involved and the CAMMS system was not used to augment exercise control. Thus, meaningful comparison with the other two environments was not possible.

For purposes of clarity, the discussion of the test is broken into two topics: (a) battalion command group/staff training using CAMMS and (b) integrated training, where CAMMS and MILES were combined to produce the training environment. The results of the test, lessons learned, and recommendations are presented separately for each topic. A comparison of the two training environments is then presented.

CAMMS BATTALION COMMAND GROUP/STAFF TRAINING

Background

Army constraints on time, money, and personnel have led to an accelerated search for more efficient and effective means of training personnel. To meet this challenge, the Combined Arms Training Developments Activity (CATRADA) has been applying manual simulation and automated data processing (ADP) techniques to command post exercise control to provide more innovative and challenging training environments. A primary focus of CATRADA is on the training of command group/staff in the area of command and control (C²).

Until recently, the primary means of training command groups has been by using command post exercises (CPX) and FTX. The CPX has been criticized for insufficient sensitivity to the players' actions and behaviors. The traditional CPX is driven by canned message inputs written prior to the exercise; thus, it follows a predetermined course. As a result, CPXs do not inform the command group of the consequences of its actions. FTXs, on the other hand, provide more realistic training; however, an FTX usually is expensive and often criticized as providing training for the command group at the expense of the troops. It is also difficult to provide sufficient friendly and opposing forces (OPFOR) personnel and equipment to exercise the command group adequately in tactics and in the management of resources while facing a realistic OPFOR.

CATRADA, in response to the above problems, has developed a family of simulations that attempt to obviate some of these difficulties. These battle simulations were developed to enhance the realism, objectivity, and credibility of command and control training; to provide commanders, command groups, and staff with a way to diagnose and overcome weaknesses identified during internal training/evaluation; and to provide a less costly means of training command groups and staffs. Recently, ADP has been applied to a number of battle simulations to achieve (a) more comprehensive storage of tactical information on a real-time basis, (b) faster and more accurate casualty determination, (c) increased objectivity, and (d) historical data for postexercise analysis and critique. One such battle simulation is CAMMS. CAMMS is designed to exercise commanders and staff at brigade and battalion level in control and coordination of combined arms operations. It provides an opportunity to evaluate a unit's

tactical standing operating procedure (SOP) and is designed for use by the commander or training manager at the unit's home station. If CAMMS is to be an effective home station training system, those responsible for training must be able to integrate the technique into the unit's training schedule and with limited manpower must plan, prepare, conduct, and analyze the results of training. In addition, they must have confidence that using this technique will satisfy the unit's training objectives within the context of ARTEP.[1]

CAMMS has the potential for providing highly effective training experiences when participation in an exercise is coupled with carefully designed analysis of command group performance and systematic feedback to participants of performance results, including acceptance and utilization of this information in future training plans. In response to the need for training diagnosis, diagnostic and feedback procedures intended for incorporation into the CAMMS system are currently being developed by the ARI Field Unit at Fort Leavenworth, Kans.

The MILES Training and Evaluation Test provided an opportunity to develop and study a prototype C^2 training environment using CAMMS in conjunction with the proposed diagnostic feedback procedures.

Test objectives

The command group training portion of the test had four primary objectives.

1. To collect data on the ability of a control team to implement CAMMS exercises after receiving the standard CAMMS controller training course. While prior studies concerning the CAMMS system have demonstrated its training effectiveness, systematic study of the implementability of the system was considered desirable. This test provides feedback to system developers concerning the effectiveness of the training program conducted by CATRADA in preparing controllers to use the CAMMS system.

2. To collect data on the implementability and utility of the proposed diagnostic feedback package. Information about the perceived value of the diagnostic feedback package was desired, as were data on the effectiveness of the instructions for using it.

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[1] ARTEP establishes the framework for home station training. It provides guidance for training and evaluating all elements of a unit from the lowest cohesive echelon (squad crew) to the battalion task force and higher. The ARTEP training and evaluation outline (T&EO) model enables the commander to evaluate his unit, develop attendant training objectives, train to those objectives, and conduct a unit reevaluation. ARTEP is designed to afford the unit leaders at all echelons the means to determine training/readiness deficiencies and to tailor remedial training to correct these deficiencies.

3. To investigate the ability of members of the CAMMS control team to serve the dual function of evaluator and controller. Typically, the CAMMS control team serves both as the controllers of the CAMMS system and as observers of the battalion command group's performance. Do controllers have the ability to perform these simultaneous functions satisfactorily--especially when the control team has not used CAMMS previously?

4. To gather data on various aspects of command group/staff training for later comparison during the integrated and battalion phases of the test (for example, enhancements or degradations in the realism with which staff activities are portrayed, changes in the speed of events, and changes in the amount of information that the command group must deal with). Each training environment provides a unique set of training benefits and associated costs. Data on these costs and benefits must be available to allow the training manager to make informed decisions on how to allocate training resources.

System Description

CAMMS. CAMMS is designed to exercise commanders and staffs at brigade and battalion level. CAMMS is capable of accommodating an exercise consisting of armor, mechanized infantry, infantry, and cavalry maneuver brigades and battalions with normal combat support (CS) and combat service support (CSS) elements in a non-nuclear environment against an appropriate enemy force. The computer program, designed to support military and logistical problems, greatly reduces map maneuver preparation time, provides faster and more accurate results, and preserves historical data for analysis and critique. Player units may participate from remote field locations or centralized administrative locations. The computer data bank includes an OPFOR segment capable of fielding two motorized rifle divisions, a tank division, and a light infantry division with all their normal support units. The program can be used to play any unit from platoon and section level to full maneuver brigade, and in any combination. The computer functions are designed to accommodate the employment of conventional forces with all their normal supporting weapons systems. Artillery, air, mortars, helicopters, administrative/logistic, and intelligence functions are handled as they would be in actual combat.

Players are required to follow the normal sequence for command and staff actions. They do not actively interact with the computer. Instead, the computer tabulates battle data and provides feedback to controllers, who return this information to players for subsequent command and staff actions over normal FM/telephone communications nets. Four data terminals link the control group with the computer. There are no canned or prefabricated messages except to start this exercise.[2]

CAMMS CTC. The CAMMS controller training course (CTC) was conducted in three phases. Phase I was the terminal operators' instruction presented to the terminal operators in 4 hours. This includes 1½ hours of lecture instruction on operating procedures and 2½ hours of practical exercise. The practical exercise portion included logging in, entering correct program, and running

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[2] Additional details about the system may be obtained by contacting CATRADA, Battle Simulations Directorate, Fort Leavenworth.

missions as directed by the chief instructor. Phase II consisted of instruction in controller duties for the exercise director and all controllers designated to run the exercise control center (ECC). This instruction included all information contained in Appendix A of this report and instructions on preparation of forms for interfacing with the computer. This period of instruction consisted of 8 hours of lecture and demonstration. Phase III was a mini-exercise conducted by the CAMMS project officer. The walk-through method was used to insure that all controllers were familiar with the proper routing of forms and computer printouts. This exercise started with an artillery fire mission. A direct fire conflict was then initiated, demonstrating to the player controllers and OPFOR controllers proper form preparation procedures. An additional unit was added to the ongoing conflict and then withdrawn to show how this action would be accomplished during an actual exercise. An air strike was fired to show procedures for attacking both units and point targets. At this point, the exercise was turned over to the controllers and allowed to run for 4 hours. The mini-exercise was halted when the principal instructor felt that the controllers were familiar with all duties necessary to conduct an actual exercise.

Diagnostic and Feedback Procedures. Of primary interest in the battalion command group component of the test was the pilot testing of a diagnostic feedback package for the CAMMS and related command group training exercises. The package describes a technique for systematically observing the command and control behaviors engaged in during a CAMMS exercise and for providing feedback to the participants concerning their performance.

Participation in a CAMMS exercise, no matter how dynamic and realistic, is not sufficient in itself to maximize the full training potential of the system. The primary objective of the present CAMMS system is to provide a training environment for the command group to exercise the command and control functions necessary to perform in a battlefield situation. However, it is important to view CAMMS or any other battle simulation within the larger training context.

Figure 2 shows the relationships among the various components of a training program. Within the context of ARTEP, it is possible to conceive of the training process as a cycle. For battalion command group training, the training manager would begin with a review of the tasks, conditions, and standards listed in ARTEP 71-2. From that list, a set of detailed training objectives would be developed. Then the training manager would begin to develop the specific content of the training (e.g., the scenario, type of exercise, length of exercise, etc.). At the same time, an observation plan would be developed to insure systematic observation of the exercise to capture diagnostic information and to summarize it in a coherent format. In addition, a procedure would be selected for returning that information to the command group. During the actual exercise, the training vehicle (in this case CAMMS) provides the training environment for the command group. Simultaneously, the performance of the command group is observed in accordance with the developed observation plan. After the exercise is completed, the exercise controllers develop an After Action Review (AAR). Assimilating the information presented in the feedback session, the command group and the training manager revise the training objectives based on the strengths and weaknesses observed during the exercise.

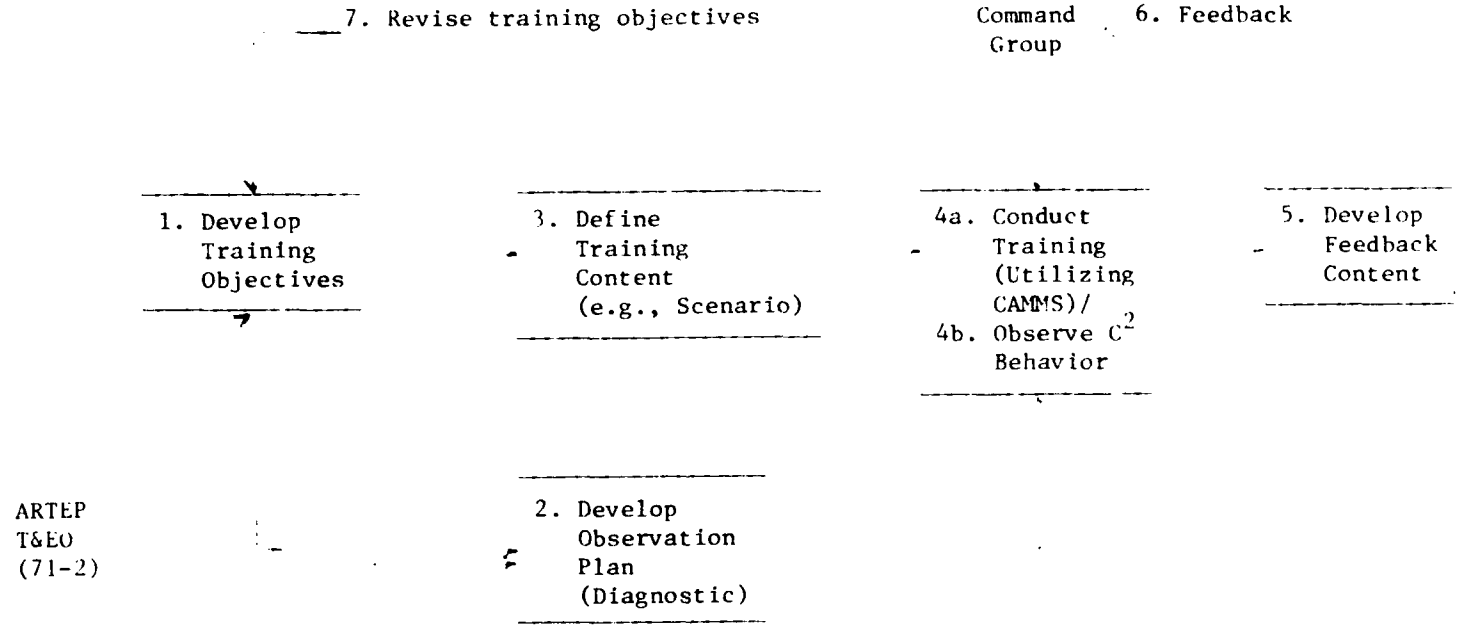

Figure 2. Relationships among ARTEP, CAMMS, and the command group.

The diagnostic and feedback procedures used in this test consisted of recommendations to the training manager on how to develop and implement a diagnostic/observation plan and a feedback procedure in accordance with the schema discussed above.

Test Design

System Components. The command group training design relates to the following five components: the CAMMS package, controllers, data collectors, evaluators, and the participant battalion command group/staff.

1. The CAMMS package was the normal configuration of hardware and software, including the controller training manuals and predeveloped scenarios, that was available for home station training at the time.

2. The CAMMS control team consisted of officers drawn from brigade and division who were experienced in the staff positions that they were required to role play. The specific duties associated with the key members of the control team are described in Appendix A. During one exercise (CAMMS I), the controllers also served as evaluators (with the assistance of a tactical operations center (TOC) observer) of the command group's performance to fulfill Test Objective 3. The company commanders, executive officers (XOs), or first sergeants, and Fire Support Team (FIST) representatives belonging to the participating battalion were classified as members of the control team. Radio operators for the brigade staff and computer terminal operators were also included.

3. The data collectors consisted of two enlisted personnel who were required to monitor the communications nets and gather information for feedback and research purposes (specific duties are listed in Appendix B).

4. The evaluation team was composed of five experienced officers who were present in the TOC during the second CAMMS exercise (CAMMS II) and rated the participants on their performance. The duties associated with the evaluation team are listed in Appendix B.

5. The participants consisted of the battalion commander and staff, appropriate staff assistants, and radiotelephone operators (RTOs).

Test Events. The command group training portion of the test consisted of a training period and two CAMMS exercises. Table 1 provides an outline of this phase of the test.

1. Support Staff Training. Prior to the CAMMS exercises, the controllers (including player/controllers and terminal operators, evaluation staff, and data collectors) received training on how to perform their duties. The program of instruction (POI) outlines for these training sessions are shown in Appendix C. This portion of the training provided the basis for evaluating the implementability of the CAMMS system and diagnostic and feedback package.

2. Exercise 1. During the initial CAMMS exercise, a covering force mission was performed on terrain in the Frankfurt, Germany, area using the scenario and terrain map included in the CAMMS kit. The exercise ran 2 days. The brigade operations order was presented to the unit on the first day. Time was

allowed for planning, during which an updated presentation for controllers was given, board preparation was completed, and an intelligence buildup began. Later in the day, the battalion operations order was presented to the company-level personnel at the battalion TOC in the presence of the evaluator/controllers. The battalion commander, S-3, and company commanders then proceeded to the exercise control center to array the forces on the control board in accordance with the operations order. The execution of the mission and a subsequent feedback session took place on the second day.

Table 1

Battalion Command Group Training Schedule

Support Staff Training (3 days)	Exercise 1 (2 days)		Exercise 2 (2 days)	
Control team	Bde OPORD	1 hr	Bde OPORD	1 hr
Evaluation team	Planning	3 hrs	Planning	3 hrs
	Bn OPORD	1 hr	Bn OPORD	1 hr
	Execution	4 hrs	Execution	4 hrs
	Feedback	3 hrs	Feedback	3 hrs
	Questionnaire	1 hr	Questionnaire	1 hr
	Mission--covering force		Mission--attack	
	Terrain--Frankfurt		Terrain-- Kastellaun	
	Control Team w/TOC Observer		Control Team	
			Evaluation Team	

During this exercise, the CAMMS control team served as evaluators in addition to their normal duties. The controllers, in conjunction with a TOC monitor or observer, evaluated the battalion command group's performance and developed and conducted a feedback session according to the plan provided in the diagnostic feedback package. Data collectors monitored command group communications and provided information to the chief evaluator/controller for inclusion in the feedback session. A separate AAR was conducted for the controllers to improve functioning in each area of responsibility.

3. Exercise 2. The second exercise took place approximately 1 week after the first. It consisted of an attack mission, which was performed over terrain similar to that used for MILES exercises. Specifically, the map used was of the Kastellaun, Germany, area, where the later field exercises were to be conducted. The mission and terrain were chosen to represent more closely the kinds of missions the command group would receive during the integrated and full battalion exercises. In this exercise, the controllers again performed the basic role playing and computer-related functions associated with the CAMMS system. Instead of a TOC observer, however, an evaluation team consisting of five experienced military observers evaluated the battalion command group during the exercise and conducted the feedback session.

The primary differences between the first and second exercises concern the evaluation effort, the mission, and the area over which the exercise was fought. CAMMS I was designed to be typical of the exercises conducted with the current CAMMS package so that implementation data could be obtained. CAMMS II provided a means of comparing the ability of controllers and evaluators to diagnose performance deficiencies and provide feedback to the command group. It also provided information concerning the changes in command group behavior that occur across exercises.

Data Collection Plan. The data collected were based upon one battalion experiencing several different training environments. Therefore, it is not possible to determine training effectiveness from the performance measurements. Consequently, most of the findings are in the form of insights provided by the participants, controllers, and evaluators as to shortcomings in the materials, procedures, and programs of instruction used.

1. Battalion Command Group/Staff Performance Measurement. A battalion command group/staff T&EO provided the basis from which performance was measured. The battalion command group/staff T&EO focuses on the actions of the battalion commander and his staff. Based on the T&EO, rating forms were developed that described the tasks, subtasks, conditions, and standards for each of the critical behaviors to be observed. Accompanying each of the subtasks was a list of observable events to help the observer determine where and when certain behaviors were likely to occur. This enabled the evaluator to observe overt actions and determine the proficiency of the command group in performance of the related subtasks. This T&EO comprises a major portion of the diagnostic feedback package. A list of the tasks and subtasks which were observed is presented in Table 2.

Following each exercise, the evaluators (during CAMMS I, this was the control team and a TOC observer), along with the corresponding participants (i.e., the commander and staff) filled out the forms derived from the T&EO. This provided two sources of information concerning command group performance for use in the feedback session.

Prior to the beginning of an exercise, each evaluator was assigned specific subtasks to observe. Some subtasks related to several staff areas, and therefore several evaluators may have observed a given subtask. The rating scale used to record the proficiency level of the battalion commander and staff consisted of a 1 to 10 scale, where 1 indicated that a great deal of improvement was required in that particular subtask and 10 indicated that there was little room for improvement. A more detailed description is presented in the diagnostic feedback package.

Table 2

Training and Evaluation Outline

Task 1. Gather and analyze required information.
- 1A. Analyze mission.
- 1B. Determine what information is available and what additional information is required.
- 1C. Determine what information sources are available.
- 1D. Gather all available information and request additional information as needed.

Task 2. Develop a plan based on mission and modify it as required by events.
- 2A. Determine friendly capabilities and limitations, request additional assets if needed.
- 2B. Estimate enemy capabilities and likely course of action.
- 2C. Identify key terrain.
- 2D. Select battle position/routes to objectives.
- 2E. Identify critical place.
- 2F. Develop and compare courses of action.
- 2G. Individual staff planning:
  - (1) Commo,
  - (2) Intel,
  - (3) Operations,
  - (4) Admin/log,
  - (5) Fires.
- 2H. Coordinate with other staff members.

Task 3. Communicate/coordinate.
- 3A. Issue a warning order.
- 3B. Disseminate plans and orders.
- 3C. Disseminate combat information and intelligence.

Task 4. Implement plan.
- 4A. Concentrate/shift combat power.
- 4B. Reinforce terrain.
- 4C. Provide supplies.
- 4D. Maintain equipment.
- 4E. Request additional assets.

Task 5. Supervise combat operations.
- 5A. Compare battlefield events with current order and concept of operations.
- 5B. Determine that a new course of action is necessary.
- 5C. Determine that a change in implementation is necessary.

2. Questionnaires from Players, Controllers, and Evaluators. Also collected during this phase of the test were the responses and opinions of the various personnel who participated in the test. The battalion commander and staff, the CAMMS controllers, and the evaluators were surveyed. Generally, the kinds of information gathered were as follows: (a) opinions of the participants as to the utility and acceptability of the exercise, (b) opinions of the data collectors/evaluators concerning the T&EO and various forms that were used, (c) opinions concerning the feedback procedures, (d) problem areas needing attention, (e) possible solutions and suggestions to improve the product, and (f) judgments on the importance, realism, and difficulty of each ARTEP subtask listed in the T&EO.[3]

Findings

Implementability of CAMMS. As indicated, CAMMS has been in the field for several years and it was not anticipated that many major adjustments would have to be made to the hands-off package associated with the system. The responses of the controllers, including terminal operators, to questionnaires administered after the controller training course and the first CAMMS exercise support that prediction. The results presented in Tables 3 and 4 generally indicate that the controller training course, which includes the associated manuals and training on how to complete the CAMMS data forms and interpret the computer printouts, was sufficient and satisfactory. On the other hand, several respondents felt that the mini-exercise portion of the course could be improved by shortening it and including the battalion command group/staff in the trial run. Most comments were about the format of the training session rather than the content of the course. In particular, some controllers felt that less classroom presentation time and more hands-on experience would be of value and would make more efficient use of time.

After the first CAMMS exercise, some of the control team personnel had additional comments about the CAMMS exercise that merit discussion (see Appendix D for specific comments).

1. Personnel. Some controllers felt that additional personnel were needed to adequately portray the associated higher, adjacent, and lower echelons of the organization. For example, they felt it was not feasible for one controller to perform both fire and air controller functions. Subsequent exercises had an additional Air Force representative to serve as air controller. Others

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[3] In addition to the above performance measurements, the communications between battalion headquarters and higher, adjacent, and lower units was monitored and recorded. The data collectors recorded five types of information: time, sender, receiver, length of transmission, and type of content. It was anticipated that the communications patterns would be sensitive to changes in command group proficiency and to changes in training environments. Unfortunately, the data collectors were not sufficiently conversant with battalion and brigade level staff structures or procedures to classify the messages accurately as to sender, receiver, and content. Hence, analysis of communications patterns must await reclassification of the tape-recorded conversations by more knowledgeable observers.

Table 3
Ratings of CAMMS Controller Training Course

	Controller Manuals			Training		
	Good	Fair	Poor	Good	Fair	Poor
Clarity	7	3		7	4	
Accuracy	9	1		9	2	
Completeness	6	4		9	2	
Organization	7	3		8	3	
Usefulness	7	3		9	2	
Ease of Use	7	3				

	Mini-Exercise		
	Good	Fair	Poor
Completeness	3	6	1
Usefulness	5	4	1
Organization	2	6	2
Length	3	2	5

Overall Training

More Than Adequate	Adequate	Less Than Adequate	Very Inadequate
4	7	1	

Adequately trained to teach controller training to your unit

Yes 8
No 4

Table 4
Ratings of CAMMS Controller Training Course--Terminal Operators

	Terminal Operators' Manual			Training		
	Good	Fair	Poor	Good	Fair	Poor
Clarity	5	4		4	5	
Accuracy	3	6		6	3	
Completeness	7	2		7	1	1
Organization	9			7	2	
Usefulness	8	1		5	3	
Ease of Use	8	1				

	Mini-Exercise		
	Good	Fair	Poor
Usefulness	5	4	
Organization	5	4	

Overall Training

More Than Adequate	Adequate	Less Than Adequate	Very Inadequate
2	7		

Adequately trained to teach terminal operation to others

Yes	8
No	1

felt that additional control personnel to guide the company commanders, provide Army air support, and provide electronic warfare (EW) support were also needed.

2. Prior experience/role playing. There were comments concerning the degree to which the company commander required prior experience to role play combat reporting realistically. The requirement that the OPFOR controller have extensive experience in OPFOR tactics to perform his duties accurately was also a source of concern.

3. Administrative. There was some confusion during the exercise on how to complete and route the forms. This was especially true in the initiation and conclusion of conflicts on a real-time basis. This resulted in time lags between events and large gaps of silence in radio traffic to the [illegible].

4. Computer Program. Finally, there were problems related to the subroutines in the CAMMS computer program. In particular, fire support algorithms were deficient, and certain types of weapon systems for both OPFOR and friendly forces that should have been available were not.

Diagnostic and Feedback Procedures. The diagnostic and feedback procedures were generally perceived to be a useful addition to the CAMMS training exercise. Eighty-three percent of the participants recommended that the diagnostic and feedback procedures be included in the CAMMS package. However, 60% of those recommending inclusion also indicated that revisions were necessary (see Table 5). The opinions, comments, and observations of those involved in the test identified several areas in need of refinement or modification. The detailed responses of the players (command group), controllers, and evaluators to the various questionnaires administered during the first two exercises are presented in Appendix E. These comments, opinions, and observations have been categorized into three major areas: diagnostic/rating procedures, feedback procedures, and controllers serving as evaluators.

Table 5

Reactions of Test Personnel to Diagnostic Feedback Package[a]

	No	Yes, but with extensive revision	Yes, with some revision	Yes
Players	2	1	4	2
Controllers	1	0	1	2
Evaluators	0	1	2	2

[a]Answers to question, "Would you recommend having the diagnostic and feedback package included with CAMMS?"

Diagnostic Procedures. The controllers and evaluators received instructions on how to develop an observation plan to facilitate the assessment of command and control performance. Using the rating forms supplied in the package, the controllers (during CAMMS I) and the evaluators (during CAMMS II) rated the command group's performance based upon their observations. The players also rated their own performance using the same rating format after each exercise.

The controllers and evaluators indicated that the diagnostic procedures were easy to use. They also indicated the procedures were useful for observing and rating command group performance but could have been more complete and better organized (see Table 6). The majority of their comments dealt with the evaluation of subtasks by appropriate staff members. Many felt that a separate evaluation packet should be developed for each evaluator/controller. It was generally felt that the packet should be modified according to the specific situation (e.g., mission, unit, staff position) observed and that instructions are needed to clarify evaluator/controller responsibility during the development of the observation plan and to show how to make the ARTEP subtasks and observable events more specific to the exercise.

Players, controllers, and evaluators were also asked to respond to the tasks, subtasks, conditions, standards, and observable events listed in the rating package. Table 7 indicates that the ratings of the training and evaluation outline were generally positive. However, a need for improved clarity and organization was expressed. In particular, it was recommended that each subtask be modified to reflect the particular duty associated with each staff position. Most raters felt that the observable events were good "reference points" to look at command group performance; however, the need to break down observable events depending on the mission and staff position was also voiced. In addition to these general comments, suggestions were made to clarify particular subtasks, conditions, and standards. These specific comments are presented in Appendix E. As indicated in Table 7, the players had a tendency to give higher ratings to the tasks, subtasks, conditions, and standards as they became more familiar with the format. This is exhibited by comparing the ratings given in CAMMS I with those in CAMMS II. This suggests that the players should be involved in the development of the training and evaluation outline to increase their familiarity. In this test, schedule constraints prevented such an effort.

The players, controllers, and evaluators were also asked to evaluate the instructions they received on how to complete the rating forms and implement the diagnostic procedures. The players and controllers received their instructions in a written form; the evaluators were briefed verbally by test directorate personnel. The players and controllers were generally critical of the utility, clarity, and completeness of the instructions (see Table 8). There was some confusion concerning the procedures to be followed in filling out the rating forms. Several questions needed to be clarified by the test directorate during the initial exercise. In general, raters felt that a more succinct explanation and description of the procedures was needed. Again, the ratings of the players increased as they became more familiar with the rating forms. However, the evaluators had no such problems, perhaps because they could ask questions during the verbal presentation. While the controllers' and evaluators' ratings of the diagnostic procedures (see Table 9) were slightly more positive, the same general concerns about the instructions were expressed. That is, less verbiage and more specific how-to-do-it directions were desired.

Table 6
Evaluation of the Diagnostic Procedures

	Completeness			Ease of Use			Organization			Usefulness		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Controllers (CAMMS I)	4	2		3	3		4	2		4	2	
Evaluators (CAMMS II)	2	3		3	2		2	3		2	2	1

NOTE: Evaluation duties were assumed by the controllers during the first exercise and by the evaluators in the second.

Table 7
Reactions to ARTEP Tasks, Subtasks, Conditions, and Standards

	Clarity			Accuracy			Organization			Usefulness		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Players (CAMMS I)	4	4		4	4		5	3		4	4	
Controllers (CAMMS I)	5	1		4	2		4	2		6		
Players (CAMMS II)	5	2		6	1		4	3		5	2	
Evaluators (CAMMS II)	3	2		3	2		3	2		3	2	

NOTE: The controllers did not perform evaluation during the second exercise, nor did the evaluators during the first.

Table 8

Reactions to Instructions for Completing Rating Forms

	Clarity			Accuracy			Completeness			Organization			Ease of Use			Usefulness		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Players (CAMMS I)	3	5		4	4		3	5		5	2	1	5	2		2	5	
Controllers (CAMMS I)	3	2	1	3	3		3	3		3	2	1	3	2	1	3	3	
Players (CAMMS II)	5	2		5	2		5	2		6	1		6	1		4	3	
Evaluators (CAMMS II)	5			5			5			5			4	1		4	1	

NOTE: The controllers did not use the rating forms during the second exercise, nor did the evaluators during the first exercise.

Table 9
Reactions to Training on Diagnostic Procedures

	Clarity			Accuracy			Completeness			Organization			Ease of Use			Usefulness		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Controllers (CAMMS I)	4	1	1	4	2		4	2		5		1	3	2	1	3	3	
Evaluators (CAMMS II)	5			3	2		3	2		4		1	4		1	4	1	

2. Feedback Procedures. Table 10 presents the responses of the players, controllers, and evaluators to the feedback procedures. All of the controllers and evaluators were very positive about the usefulness of the feedback procedures. To a lesser extent, the players also felt that training benefit was derived from the feedback. The ratings on other characteristics of the feedback procedures were also highly positive, with the exception of the players' reaction to the accuracy of the first feedback session. The major problem of the feedback sessions was that they were too short. More time was needed to develop the feedback content and to discuss the various ratings and findings with other controllers/evaluators in preparation for the session. Also, there was a need for more time to discuss the ratings with the players during the individual one-on-one sessions. The participants also felt that the feedback procedures did not make adequate use of company commanders.

Another aspect of the feedback sessions appeared to be less than satisfactory. The group sessions where the players, controllers, and evaluators came together to discuss the outcome of the exercise were not very informative and were awkward and uncomfortable for all concerned. During the integrated phase of the test, the group session was modified in response to this problem.

Table 11 indicates that the controllers were less than satisfied with the feedback procedure instructions, in contrast to the evaluators, who received verbal instructions. The primary difficulty appeared to be a misunderstanding as to what the responsibilities and options of the controllers were during the first exercise.

Controllers as Evaluators. One of the primary objectives of this phase of the test was to look at the ability of the controllers to perform the duties of controller and evaluator simultaneously. Table 12 presents several items on the questionnaire which relate to this objective. The first two items refer to the ability of the controllers and evaluators to observe command group performance and the confidence they placed in their ratings of command group performance. The controllers generally felt that there was very little opportunity to observe command group performance, whereas the evaluators felt that they had extensive opportunities to observe. This inability to observe the command group apparently reduced the confidence the controllers placed on their ratings of the command group's performance. When the controllers were asked the extent to which the observation/rating requirements interfered or conflicted with their controller duties, two-thirds felt that they did interfere at least some times during the exercise. Finally, five of the six controllers recommended that controllers not be used as observers/evaluators, while the sixth indicated that this should occur only if there is a shortage of trained personnel. However, there was little agreement as to the exact number of observers or evaluators required. The practice of having one TOC observer appears not to be a sufficient remedy to the overtaxing of the control team. Based on this test, it appears that the number of evaluators should be more than one, but that five (used in CAMMS II) may be too many.

In general, the controllers did not feel comfortable or confident, nor did they perceive that feedback to the players was accurate or valuable. The participants in the exercise were asked to react to the feedback they received under the two situations and, as shown in Table 10, they tended to rate the feedback received from controllers after the first CAMMS exercise to be less accurate and less useful than that received from the evaluators in the second

Table 10

Evaluation of Feedback Procedures

	Completeness			Usefulness			Accuracy			Length			Ease of Use			Comfortableness		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Players (CAMMS I)	6	3		5	4		3	5	1	6	2	1	N/A			5	2	1
Controllers (CAMMS I)	5	1		6			N/A			4	1	1	4	2		3	3	
Players (CAMMS II)	5	1	1	6	1		6	1		6	1		N/A			3	3	
Evaluators (CAMMS II)	4	1		5			N/A			4	1		4	1		5		

NOTE: The controllers did not give feedback during the second exercise, nor did the evaluators during the first. The controllers and evaluators were not asked to judge the accuracy of the feedback they provided.

Table 11
Reactions to Training on Feedback Procedures

	Clarity			Accuracy			Completeness			Organization			Ease of Use			Usefulness		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Controllers (CAMMS I)	3	1	2	2	3	1	4	1	1	4		2	3	1	2	3	2	1
Evaluator (CAMMS II)	5			4	1		4	1		4	1		5			4	1	

Table 12
Responses to Questionnaire Items
Dealing with Controllers as Evaluators

1. How much opportunity did you have to observe (measure command group behavior)?

	Extensive	A Lot	Some	Very Little	None At All
Controllers (CAMMS I)	1	0	2	3	0
Evaluators (CAMMS II)	4	0	0	1	0

2. Given your opportunity to observe the command group, how confident do you feel about your ratings of command group behavior?

	90 - 100	70 - 89	50 - 69	30 - 49	0 - 29
Controllers (CAMMS I)	1	3	0	2	0
Evaluators (CAMMS II)	3	1	0	0	1

3. To what extent did the observation/rating requirements interfere (conflict) with your controller duties?

	A Great Deal	Often	Sometimes	Seldom	Not At All
Controllers (CAMMS I)	1	1	2	1	1

4. Would you recommend having controllers also serve as observers/evaluators?

	Yes, Without Reservation	Yes, but Only if Short of Training Personnel	No
Controllers (CAMMS I)	0	1	5

5. Rate the diagnostic and feedback session conducted during this exercise (CAMMS II) in relation to the first exercise.

	Much Better Than the First	Better Than the First	Both Were the Same	Worse Than the First	Much Worse Than the First
Participants (CAMMS II)	2	5	0	0	0

CAMMS exercise. The players also rated the feedback session received during the second CAMMS exercise to be better overall than that received during the first exercise (Table 12).

Also examined were the ability of the participants themselves to rate their performance and the degree to which their ratings agreed with those of outside observers (i.e., controllers or evaluators). Table 13 showed how the self-ratings of the players or participants compared with ratings given by the controllers or evaluators. Looking at absolute differences between participant and observer ratings, only the battalion commander and the S3 tended to be closely aligned (within one rating scale unit) with the external observer. In general, the other participants tended to rate themselves higher than the corresponding external observers. Since there were no external criteria to judge the performance of the command group, it is not possible to determine which of the two groups was more accurate. However, the results do indicate that the difference between perceptions of the participant and observations of an outside evaluator may have to be considered during the feedback sessions.

Discussion

CAMMS Implementability. This test provided an excellent opportunity to view the CAMMS system as it is used by a newly trained control team. Results indicate that methods and procedures to increase the amount of hands-on training for the control team should be explored. This should include ways of increasing the amount of practice the controllers receive in administrative (e.g., completion of forms) and role-playing duties in the mini-exercise. The comments and suggestions made by the controllers concerning additional personnel are presently addressed in the CAMMS control manuals. Any decisions to be made concerning increased personnel must rest with the unit supporting the training. If sufficient resources are not provided, a degraded control effort will occur. The training manager should be aware of these trade-offs prior to the exercise. The developing agency for CAMMS was also aware of the shortcomings in the computer programs concerning weapon system update and of deficiencies in certain algorithms. An improved computer-assisted battle simulation is being developed to refine and expand the current CAMMS, based on lessons learned in fielding the present system.

Diagnostic and Feedback Procedures. Based upon the experiences of this test, a modified version of the diagnostic feedback package is being considered for incorporation into the CAMMS system. This package will serve as a guide for the training manager and will provide a starting point for the development of any diagnostic and feedback program. It is expected that this package will prevent the training manager from having to "reinvent the wheel" and, at the same time, provide him with sufficient flexibility to modify the package to suit the needs of his unit. Specific modifications that will be made in the diagnostic feedback package include the following:

1. The instructions will be divided into parts and addressed to specific members of the evaluation team. The discussion of the need for a diagnostic feedback package, the planning sequence, and the suggested allocation of tasks will be directed toward the training manager. A separate packet will include a set of detailed instructions for evaluators given specific areas or functions to observe. This should eliminate much of the criticism about the wordiness of

Table 13

Comparison of Player and Evaluator Performance Ratings

Raters	Performance Rating Differences[a] +3	+2	+1	0	-1	-2	-3
BC - TOC OBS (CI)[b]		2	10	4	5	5	
BC - Ch Controller (CI)				4	10	5	
BC - Ch Eval (CII)[c]	1	6	9	2	1	1	
S1 - Bde S1/4 (CI)	2		3		2		
S1 - S1/4 Eval (CII)	2	1	1	2	1	1	
S4 - Bde S1/4 (CI)	1	3	1	2			
S4 - S1/4 Eval (CII)	2	5		1			
XO - Bde S1/4 (CI)	2	2				1	
XO - S1/4 Eval (CII)	3	3					
S2 - Bde S2 (CI)	1	3	2	1	2	1	2
S2 - S2 Eval (CII)	2	4	2	1	3	1	2
S3 - Bde S3 (CI)	2		2	3	7	1	
S3 - S3 Eval (CII)		2	7	10			
FSO - Bde FSO (CI)	NO DATA						
FSO - FSO Eval (CII)	1	6	2	3			

[a]Table entries are frequencies with which subtask ratings provided by participants deviated by the indicated amount and direction from those provided by evaluators and controllers. (e.g., a participant rating of 9 and an evaluator score of 7 would result in a performance rating difference score of +2).

[b]First CAMMS exercise.

[c]Second CAMMS exercise.

the instructions. In addition, the instructions will be augmented by careful delineation of evaluator responsibilities for adapting the T&EO and the observable events to the particular training situation.

2. Additional modifications will be made in the format of the feedback session to incorporate the company commanders in more of the tasks to be performed. Specifically, the company commanders will provide information to the evaluators in the development of the content of the one-on-one sessions. In addition, the company commanders may be requested to sit in with the S3 one-on-one session to provide insights into the running of the battle. It is also anticipated that the company commanders will have a greater input into the modified group sessions described below.

3. The group session will be changed to fit the format used during the later stages of the test more closely. That is, a method will be developed for the evaluators to ask specific probing questions of the command group and company commanders to elicit responses about the interactions between the company commanders and the command group during the exercise. The clarity of the operations order and fragmentary orders given by the TOC can be examined, as can the clarity and completeness of information passed from the company commander up to the TOC. This should occur during discussions about differences in perceptions of battlefield events during particular phases of the battle.

INTEGRATED BATTLE SIMULATION/ENGAGEMENT SIMULATION TRAINING

Background

The integrated phase of the MILES Training and Evaluation Test, USAREUR, examined the feasibility of the concept of combining command post and field exercises in simultaneous multiechelon training using CAMMS to drive the CPX and MILES to structure the FTX. The concept is of interest for two reasons. First, the increased range and mobility of modern weapon systems and corresponding changes in tactical doctrine have expanded the physical dimensions required of training areas for training at all echelons, whereas budgetary and environmental constraints preclude the acquisition of additional land areas to meet the increased need. If realistic battalion-level command group/staff training can be achieved with one live company in the field or if brigade-level exercises can be run with one battalion in the field, a significant reduction in the demand for training space can be achieved by training the lower echelons in rotation. This issue is of particular importance for USAREUR and provides one justification for the test site selection. Second, multiechelon training is of interest to the Army as a means of compressing the time required for training, since time at the major training areas is also at a premium.

The stimulus to considering BS/TES integration was the desire for optimal use of facilities at the new National Training Center at Fort Irwin, Calif. NTC is designed to provide unit training in all tactical skills up through battalion level. Since it would be wasteful to leave facilities for higher echelon training idle while the smaller units train, a utilization concept that involves simultaneous use of NTC facilities by several battalions in different stages of their training cycles was proposed. A natural extension of this concept is to train by brigade, permitting the brigade staff to CPX with the battalion staffs of those units undergoing small unit training and simultaneously

to direct the activities of a unit involved in a battalion task force field exercise.

In this test, the integration of battle simulation and tactical engagement simulation was accomplished by taking advantage of developing technologies currently available in the U.S. Army Training and Doctrine Command (TRADOC): CAMMS and MILES. CAMMS is described in detail in the first part of this report. MILES is the most recent tactical engagement simulation technique that has been introduced into Army field training. It is designed to provide situational fidelity and realistic casualty assessment that was lacking in previous training systems. MILES consists of a family of low-power, eye-safe lasers that simulate the direct fire characteristics of various weapons systems in the Army arsenal. Laser sensors mounted on individuals and vehicles discriminate between kill and near-miss beams to provide immediate casualty determination. Designed for use by unit commanders and other training managers at home station, MILES has primarily been used to train company teams and smaller units. This test investigated the concept of integrating a company team undergoing field training using MILES with a battalion task force headquarters (battalion commander and staff) receiving command post training with CAMMS. As a necessary precursor to testing the concept, a prototype integrated training system was designed for implementation in this test.

The implementation of the integrated training concept in the MILES T&EO test was determined largely by limitations on personnel resources and system availability. The decision to examine the concept at battalion level was mandated by the fact that brigade and battalion command/staff participants and division-level controllers and evaluators could not be devoted to test activities for the necessary length of time. System availability dictated the choice of CAMMS as the CPX driver, as CAMMS is already fielded in Europe. The test budget could not support acquisition of, nor scenario development for, the more expensive, advanced computer-driven battle simulation system proposed for installation at NTC. Similarly, the restricted availability of MILES equipment limited the scope of the integrated portion of the test to examination of one battalion task force in one configuration of an integrated training system.

Test Objectives

The primary objectives of this phase of the test were threefold:

1. To determine the feasibility of integrating battle simulation (CAMMS) and tactical engagement simulation (MILES) technologies.

2. To develop control structures and information handling procedures required to integrate the systems. During the development and evaluation of the prototype system, various information and control requirements critical or unique to an integrated format were identified.

3. To identify the relative training benefits of the three training environments created during the CAMMS, integrated, and full battalion exercises.[4] Each training environment provides a unique set of training benefits and associated costs, the specification of which allows the training manager to make informed decisions on how to allocate resources. Analysis of the three training environments suggested that a more complex situation confronts the commander and his staff the more troops there are on the ground. This has important implications for the sequencing of training and also suggests ways to augment the realism of current battle simulations.

System Description

The integrated exercise system merges the capabilities of CAMMS and MILES to support the management of the exercise, performance assessment, and training feedback. The system consists of four subsystems: the Exercise Control Center (ECC), the Net Control Center (NCC), the Tactical Operations Center (TOC)/Combat Trains, and the Field Control component. The four subsystems are physically separated but interfaced by means of FM radio communications. A diagram of the various subsystems and communication nets is presented in Figure 3.

Exercise Control Center. The ECC is the major control mechanism for the integrated exercise. It houses the exercise director and his immediate staff, who have overall responsibility for the conduct of the exercise. Located in a permanent facility, the ECC contains the CAMMS telecommunications equipment, terrain board, and related equipment. Also located at the ECC are the personnel who represent the brigade staff, adjacent units, and supporting elements (e.g., artillery battalion, close air support, attack helicopter).

The ECC/CAMMS control team consisted of officers drawn from brigade and division who were experienced in the staff positions they were required to role-play, supported by company-level players/controllers drawn from the test battalion. This is the same team used during the CAMMS exercises. To conduct the integrated exercise, additional controller personnel were required. One of the additional controllers served as the representative of the live company team that was exercising in the field. He worked alongside two "notional" company commanders who were under the control of the battalion commander but did not have units physically present in the field. While the live company team representative moved markers in accordance with events in the field, the two notional company commanders moved their units and conducted the battle in accordance with CAMMS procedures.

In addition to the maneuver battalion, the opposing force was also represented in the exercise control center. The OPFOR controllers represented all opposing forces in accordance with CAMMS requirements and served as countermovers for the live OPFOR on the ground. The second additional controller was used to man the field control radio, receiving information from the NCC and passing it on to the live company team representative and the OPFOR team.

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[4] As previously indicated, the battalion task force exercise was not performed in a manner suitable for comparison.

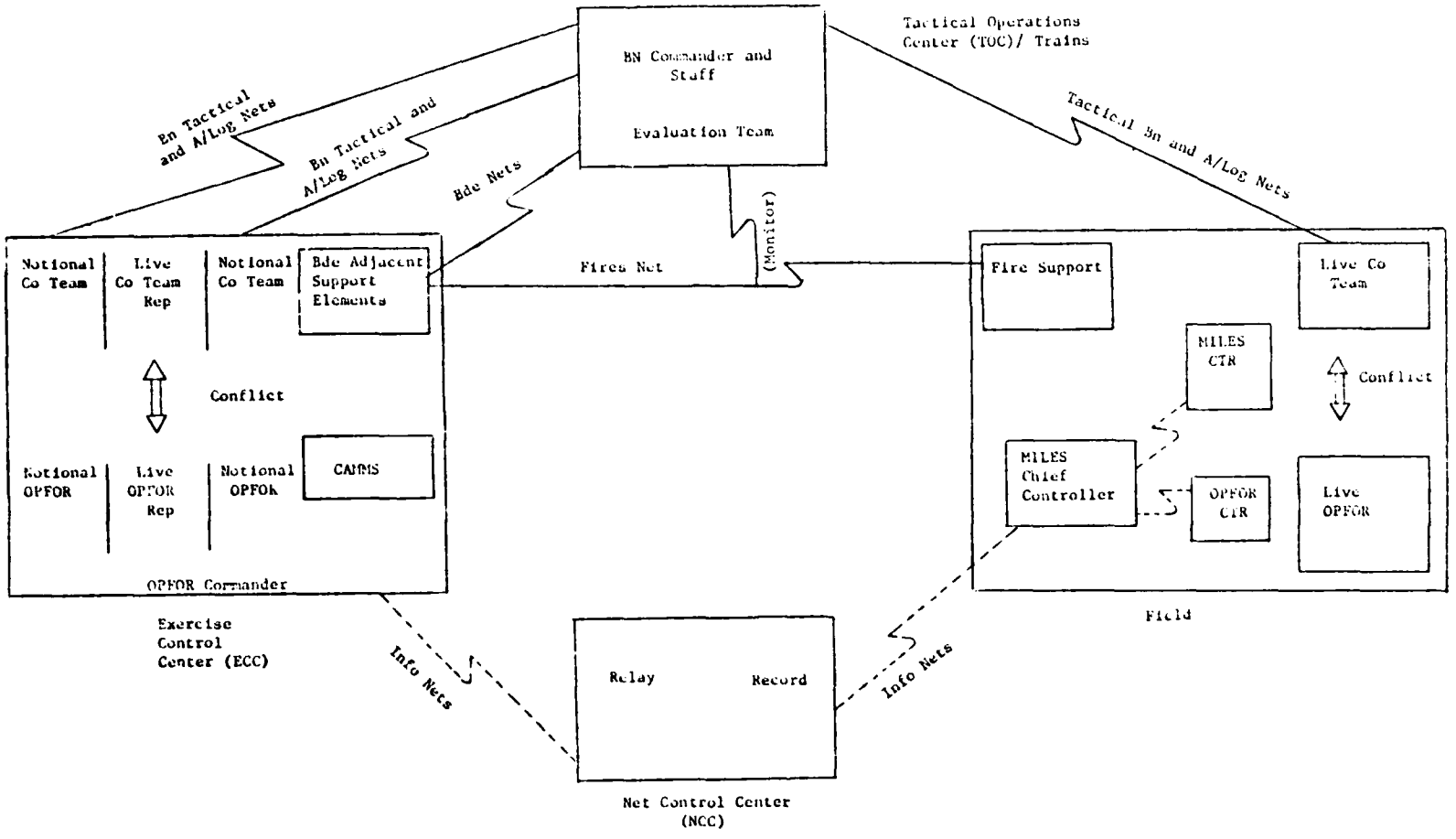

Figure 3. Integrated configuration.

An additional function of the ECC was to forecast maneuver unit activity using the LOOKAHEAD computer program. This option provided a limited capability to forecast outcomes of engagements before they occurred in the maneuver area by entering a special conflict algorithm that supplied casualty summaries without affecting the admin/log data base.

Net Control Center. The NCC served as a relay station (located in an M577 command vehicle) between the company team field operations and the ECC. The NCC effectively reduced the distance between the exercising units and the ECC, received information from the field in terms of specific combat details, summarized the combat information in a format acceptable for the ECC, and passed that information to the ECC. The discrete combat details obtained in the NCC were retained for company-level feedback. Two enlisted personnel manned the NCC.

Tactical Operations Center/Trains. The TOC/Trains housed the battalion commander and his staff, including support personnel such as radio telephone operators. Co-located with the battalion commander and staff was the evaluation team, tasked with the responsibility of observing and evaluating command group behavior. The evaluation team was composed of five officers. These were the same evaluation team members who participated in the CAMMS exercises. The duties associated with the evaluation team are presented in Appendix B.

Field Operations. The Field Operations included a control team, the live company team, and the live OPFOR using MILES equipment in company-level operations. The MILES hardware package consisted of low-power, eye-safe lasers which were attached to direct fire weapon systems to simulate the characteristics of the M16-A1 rifle; the M60, M2, and M85 machine guns; the VIPER, DRAGON, TOW, and SHILLELAGH missile systems; and the 105mm and 152mm tank main guns. The control team consisted of controllers/evaluators who monitored and managed the MILES training environment, including the live OPFOR unit, and also evaluated company-level performance. Controllers also had the responsibility for obtaining casualty and unit location information to be passed to the NCC and relayed to the ECC so that appropriate representations could be reflected on the terrain board. Another component of the MILES control team was the fire support element. The fire support element was responsible for representing the artillery play, including receiving indirect fire missions, marking location of artillery impacts, and determining indirect fire results for the live battle.

Test Design

Test Events. The integrated phase of the test consisted of two integrated exercises and an intervening 14-day period set aside for modifications to the integrated format dictated by the results of the first integrated exercise.

1. Integrated Exercise 1. The sequence of events for the exercise lasted 3 days. The first day consisted of an orientation for the controllers and evaluators on changes from CAMMS or MILES training that were required by the integrated format. On the following day, the exercise was begun. The exercise consisted of an attack mission over the same local terrain (i.e., Kastellaun) as the command group experienced during the second CAMMS exercise. During the second day, the command group received a brigade operation order (OPORD), developed a plan, and issued the battalion OPORD. On the third day, the mission

was executed. The terrain used during this exercise corresponded to that being occupied by the field company, and adjacent lanes were assigned to the two "notional" companies. After the exercise, the controllers and evaluators conducted a feedback session for the participants. Following the feedback session, a questionnaire was administered to all involved in the exercise.

2. Retrofit. After the first exercise, the questionnaires administered to the participants, controllers, and evaluators were examined. The problems identified by the respondents as well as those noted by the test directorate were analyzed and, where possible, modifications in the training system were developed to eliminate them.

3. Integrated Exercise 2. The second exercise again occupied a 3-day period. During the first day, controllers and evaluators were briefed on changes in communications and exercise control procedures that were to be implemented during the exercise. Planning by the battalion staff occupied the second day and mission execution the third. During this exercise, a different company team performed the FTX. The exercise was again concluded by feedback to the participants, followed by questionnaire data collection.

Data Collection Plan. The test design did not permit determination of training effectiveness from performance measures, since there was no comparison group. Furthermore, changes in performance due to the training environment cannot be distinguished from changes due to learning. Consequently, the primary data collection effort was designed to elicit insights from the participants, controllers, and evaluators on shortcomings in the procedures used and the perceived training benefits of the exercises.

1. Questionnaires from Players, Controllers, and Evaluators. The responses and opinions of the various personnel who participated were collected during this phase of the test. The battalion commander and staff, the CAMMS controllers, the MILES controllers, and the evaluators were surveyed. Generally, the kinds of information gathered were as follows: (a) the perceived utility and acceptability of the exercise, (b) the identification of various problem areas that need to be resolved, (c) possible solutions and suggestions to improve the product, and (d) the perceived importance, realism, and difficulty of each ARTEP subtask listed in the T&EO.

2. Battalion Command Group/Staff Performance Measurement. A battalion command group/staff T&EO provided the basis for diagnosis and feedback. It focused on the actions of the battalion commander and his staff. Based upon the T&EO, rating forms were developed that described the tasks, subtasks, conditions, and standards for each of the critical behaviors to be observed. Accompanying each subtask was a list of observable events to help the observer determine where and when certain behaviors were likely to occur. This enabled the evaluator to observe overt actions and determine the proficiency of the command group in performance of the related subtasks.

Following each exercise, the evaluators and the corresponding participants (i.e., the commander and staff), filled out the forms derived from the T&EO. This provided two sources of information concerning command group performance for use in the feedback session and aided in the comparison of training environments.

Findings

Two types of data were gathered--evaluative and diagnostic. The evaluative data consisted of subjective opinions about the fidelity, utility, and training benefit of each exercise, judged both separately and in comparison with previous exercises. There were also ratings of the realism, importance, and difficulty of each ARTEP subtask. Finally, ratings of command group/staff performance by participants and evaluators were compared to determine the extent to which the addition of the live company aided in unifying perceptions of performance. The diagnostic data consisted of detailed comments by controllers, evaluators, and participants about problems identified during each integrated exercise and suggested solutions.

In general, the integrated training was judged to be satisfactory in most areas; however, CAMMS was preferred as a training environment for the command group/staff. Several problems occurred in the first integrated exercise (INTEG I), particularly in the area of gathering control information and reporting it to the ECC. The system was modified during a "retrofit" period preceding the second integrated exercise (INTEG II). The modifications were successful in reducing the number of problems identified, though some control problems persisted. After INTEG II, all but one of the participants agreed that the integrated format should be used in future training exercises, though the majority felt that "some" or "extensive" revision was needed.

The detailed results of the diagnostic effort are reported first to provide a context for the evaluative results. The results are reported in five sections:

1. "Problems Identified in the First Integrated Exercise" summarizes the detailed comments of the observers and participants.

2. "Retrofit" is a discussion of measures taken to alleviate information and control problems that occurred in the first exercise.

3. "Problems Identified in the Second Integrated Exercise" summarizes detailed comments on the second exercise.

4. "Relative Training Benefits" summarizes the opinions of controllers, evaluators, and participants as to the relative value of BS and BS/TES integration and relates command group performance ratings provided by players and evaluators to this issue.

5. "Realism, Importance, and Difficulty Judgments" examines opinions about these dimensions of exercise quality and relates them to the overall question of training benefit to be derived from integration.

The first three sections deal primarily with data related to requirements for successfully running an integrated exercise, whereas the last two deal with the issue of whether integration adds to or detracts from the training that could be achieved using separate CPXs and FTXs. As indicated, the test environment did not provide the experimental controls necessary to infer training benefits from performance measures.

Problems Identified in the First Integrated Exercise. At the completion of the first integrated exercise, a questionnaire was administered to all participants. It solicited their opinions concerning problems encountered during the exercise and asked for solutions. The responses are grouped into three categories: information flow, coordination and exercise control, and miscellaneous. Information flow problems involved gathering information in the field, transmitting it to the ECC, and passing control information from the ECC to the field. Control/coordination problems included directing the OPFOR, dealing with restrictions on the player unit, synchronizing movement, integrating fire support, and integrating the live unit with notional units. Miscellaneous problems were changes needed in resources and in the training system supporting the exercise, but which were not related to the execution phase of the exercise. Appendix F contains detailed comments by the participants.

1. Information Flow. The most persistent problem encountered during the first exercise concerned the gathering and reporting of casualty and unit location data for the live units to the ECC.

- There were not enough field controllers (one per platoon) with the friendly forces to keep track of locations and casualties on a timely basis when the units operated as separate sections.

- The additional reporting requirements imposed by the integration (periodic updates on unit location and status) crowded the control net, resulting in delays in reporting to the NCC during the peak periods of the battle.

- Further delays in reporting occurred due to the positioning of the relay operator in the NCC vehicle. He had to gather data as it was reported from the field, summarize it in a form suitable for use in the CAMMS system, and retransmit over the OPFOR control net. The normal delay occasioned by retransmission was compounded by crowding on the relay net. Worse still, a major communication breakdown occurred during the early hours of the exercise, leaving the ECC in the dark as to events in the field that could not be determined from the player unit's normal reporting over the battalion command net.

- During the exercise, the live OPFOR occupied and remained in a position that would have been untenable had the overwatching notional force been able to inflict casualties on them. It became apparent that direct communication from the ECC to the live OPFOR was necessary, either to update the OPFOR leader on the state of the notional battle or to command the OPFOR directly from the ECC.

2. Control/Coordination. The integrated format is heavily dependent upon the receipt of timely information from the field. The information flow and communications problems degraded the control and coordination of the first exercise to the extent that it was difficult to determine what control problems would have existed in their absence. A few comments, however, could be ascribed to inherent flaws in the procedures for control/coordination.

- In addition to the OPFOR control problem discussed under information flow, the OPFOR in the field experienced difficulty in maneuvering to fight the live company. Since the ECC has information on both live and notional forces, it is the logical site from which to control the live OPFOR; however, the need had not been anticipated, so ECC authority to provide direction did not exist during the first integrated exercise.

- It appeared that synchronization of movement for live and notional forces would remain a problem even if information from the field were suitable within the 15-minute resolution established for this exercise.

- The dual fire direction system used to support live and notional indirect fire missions was not totally satisfactory. Information on missions and rounds fired by the MILES fire marker teams was not available to the ECC in sufficient detail and was not displayed on the control board.

- Administration/logistics (A/L) was not played for the company in the field. The company XO was used as a tank gunner, rather than in his normal position, so all A/L play at the battalion level was supplied by the notional companies. The consequent dearth in traffic over the A/L nets reduced the training benefit of the exercise for a significant part of the battalion staff.

- Notional and live units became mixed on the control board, partially because of lags in reporting from the field, but also because of the scheme of maneuver developed by the player battalion. Since an early policy decision in the development of the integrated format was to maintain realism for the live company, direct fire conflicts between live and notional units were not allowed. Strict adherence to this policy might also require restrictions on the scheme of maneuver, thereby sacrificing realism in the battalion TOC for realism in the field. Similarly, restrictions on the command group's options may be required to prevent their concentrating exclusively on the "real" battle and neglecting the notional units. These problems were anticipated, but the attempt to prevent them through careful selection of the mission and terrain was not completely successful, according to comments from the controllers and evaluators.

3. Miscellaneous Problems. Administrative problems in conducting the exercise and the subsequent feedback sessions and residual problems inherent in integrating the two systems constitute the bulk of the miscellaneous problems identified in INTEG I.

- Practical difficulties surrounding reconstitution of forces in the field surfaced as a problem. The small unit in the field can easily be wiped out in one short battle. If this occurs, the integrated exercise quickly becomes disintegrated unless the force is reconstituted. The MILES equipment must be reset by a controller key to function after a simulated "hit." Assembly of nonoperational weapons systems for resetting and reintroducing the equipment to the simulated battle are controller-intensive processes that were not fully allowed for in the integrated system procedures and resources.

- A major problem occurring after the exercise was the scheduling of feedback sessions. The field controller/evaluator had to turn in equipment, conduct the company-level AAR, and then report to the ECC to provide input to the command group feedback preparations. This resulted in a great deal of slack time at the ECC, followed by a rush to develop the information for the feedback sessions. As a consequence, the command group sessions were not so well prepared as during the command group training portion of the test, and the additional perspective that might have been gained from the controllers in the field was not used to full advantage.

Retrofit. Modifications were made in the integrated exercise system prior to the second integrated exercise to address problems that could be corrected within the resources provided for the test.

1. Information Flow Problems.

- Resource constraints prevented the addition of extra field controllers; however, periodic reporting requirements were modified for cases of "no change," thereby relieving some of the burden on the available controllers. The NCC situation report used to summarize field reports for CAMMS was also streamlined to adapt more readily to cross-attachments in the live company.

- The relay operator retained the responsibility for summarizing casualties; however, he was stationed in the ECC to monitor a rebroadcast of the field controllers' reports. The NCC's communications equipment was augmented by an ARN-292 relay transmitter for this purpose. As casualty reports came in, they were immediately passed to the A/L work station for entry into the CAMMS computer programs.

2. Control Problems.

- A communications channel between the OPFOR in the ECC and the OPFOR in the field was established. A representative of the MILES control team served as a liaison between the OPFOR controller in the ECC and the MILES controller who had direct responsibility for the OPFOR in the field.

- The XO for the live company team was relieved of other duties for the second integrated exercise so that he could concentrate on his A/L responsibilities.

- The remaining control problems either could not be alleviated with the available resources (fire direction system) or were so closely tied to information flow that improvements in control were expected to result from modifications in the information processing procedures.

3. Miscellaneous Problems.

- Procedures for reconstitution of forces in the field could not be improved with the available resources.

- The feedback procedures were modified so that the chief field controller would return from the field earlier than in the first exercise and participate more extensively in the command group/staff feedback sessions.

Problems Identified in the Second Integrated Exercise. At the completion of the second integrated exercise, a questionnaire was again administered. Problems identified are categorized as before (see Appendix G). Fewer comments relate to information gathering and information flow than in the first exercise. The number of control problems identified was not substantially reduced, though their magnitude seems to have been.

1. Information Flow. Locating the relay operator in the ECC increased the speed and ease with which information flowed from the field to the ECC; however, two problems persisted:

- Field controllers were hard pressed to report the required location and status information. Additional personnel are needed for information gathering, although this might compound the information reporting problem unless additional communications facilities are added as well.

- On a number of occasions, the events in the field occurred too rapidly for the location reporting system to reflect them accurately. Thus, an anachronistic picture of events was presented to the control team and subsequently to the command group through the player/controllers. Furthermore, the accuracy of position reports from the field was questioned. Locations did not match those being reported through the battalion command net, though it is not certain which reporting system was at fault.

2. Control/Coordination. Despite the alleviation of information gathering and reporting problems, several control and coordination problems remained.

- The incorporation of a direct communications channel between the OPFOR in the field and the OPFOR in the ECC reduced some of the coordination problems encountered during the first exercise. However, the coordination of the effort between the two OPFOR elements was still hampered by the various layers of control between the elements. That is, the OPFOR in the field did not work directly for the commander in the ECC but through a field controller. Any coordination required between the two had to go through the field controller's chain of command, resulting in delay and asynchronous execution of movements.

- As in the previous exercise, many observers commented that the mixing of notional and real units created an unrealistic and confusing situation.

- As described earlier, the activities in the field determined the pace of the exercise and drove the overall battle. It was anticipated that the field exercise would be more realistic and more difficult to manage, and that the notional units would have greater flexibility to adjust to differing situations. However, this slanting of the influence to the field exercise tended to detract from the training potential of the battle simulation by placing certain restrictions on the potential

activities and options available within the battle simulation component. Close air support, attack helicopters, and A/L play appeared to be seriously degraded by this technique.

- The battalion command group had a tendency to concentrate on the one company in the field and spend much of its time with that unit in comparison with the two notional companies. This occurred despite the fact that the two notional companies were also in heavy combat with OPFOR units.

3. Miscellaneous Problems. The LOOKAHEAD computer program did not appear to be as useful as anticipated. While the program did predict outcomes that later occurred on the battlefield, the information was of dubious utility for managing an exercise at this echelon. In fact, in no case did this information influence the decisionmakers managing the exercise.

Relative Training Benefits. In an effort to gain insight into the potential training benefit of the various training configurations, the perceptions of the participant command group concerning the value of the training they received under the various training environments were obtained. Following each exercise, the participants were asked to respond to questions dealing with the fidelity or realism and the perceived training utility of the exercise they had just experienced. While questionnaires were administered after each of the integrated exercises, it was decided to compare only the second CAMMS exercise with the second integrated exercise to minimize the novelty effect of the integrated format. In addition, it was anticipated that the first integrated exercise would be quite rough in that it was the first attempt at such a technique. Thus, any comparison may have been misleading.

Each participant was asked to rate the second CAMMS exercise and the second integrated exercise on five aspects of realism: combat activities, combat support activities, outcomes of battlefield engagements, enemy tactics and weapons capability, and the speed of events on the battlefield. The ratings presented in Table 14 indicate that neither of the exercises was perceived to be highly realistic. The CAMMS II exercise was perceived to be more realistic than the integrated exercise in the area of combat activities, combat support activities, and speed of events on the battlefield. While the differences were slight, the integrated environment was rated higher in outcomes of battlefield engagements and enemy tactics and weapon capabilities. Although the findings are far from conclusive, the participants tended to perceive the CAMMS exercise as providing a slightly more realistic training environment. One possible explanation for this difference may be due to the control difficulties encountered during the integrated exercises.

Questions that dealt with various aspects of perceived training utility were also included. The ratings were averaged across all participants and are presented in Table 15. The ratings are generally more positive (i.e., higher) than the realism ratings. This appears to indicate that although realism is a valuable asset in any training environment, it is not necessarily a primary determinant of training utility.

Table 14

Mean Ratings of Perceived Realism[a]

Aspect	CAMMS II	INTEG II
Combat activities	3.2	2.6
Combat support activities	2.8	2.4
Outcomes of battlefield engagements	2.3	2.4
Enemy tactics and weapons capabilities	2.8	3.0
Speed of events on the battlefield	2.8	2.2

Note: N = 9.

[a]The ratings could range from 1 (no realism at all) to 5 (a great deal of realism).

Table 15

Mean Ratings of Perceived Training Utility[a]

Aspect	CAMMS II	INTEG II
Improved ability to perform in position	3.8	2.8
Feedback on consequences of actions/decisions	3.2	2.8
SOP exercised	3.8	3.6
Stress	2.7	2.2
Involvement	4.2	4.2
Overall training utility	3.8	3.0

Note: N = 9.

[a]Ratings could range from 1 (not at all) to 5 (a great deal).

Both training configurations were perceived to provide an opportunity for the command group to exercise their SOP, and the participants indicated that there was a high degree of involvement in both exercises. They also indicated that the CAMMS environment did a slightly better job of providing feedback to the command group concerning the consequences of their actions or decisions. The CAMMS environment also appeared to provide a better opportunity to improve a participant's ability to perform in the position he occupied during the exercise. However, this difference may be partly because the integrated exercise followed the CAMMS exercise, and any large learning increment may have already occurred. The participants also reported that they felt more stress during the CAMMS exercise than during the integrated exercise. This may be due to the decision of the test directorate to allow the pace of the battle to be driven by those events occurring in the field, resulting in a slower paced series of events. Overall, the participants reported that they received better training during the CAMMS exercise than during the integrated exercise, though the integrated exercise was also rated "satisfactory" on the average.

The diagnostic and feedback techniques developed for the CAMMS package were modified and incorporated into the integrated exercise. In general, the reactions of the participants, controllers, and evaluators to the modifications made to the group feedback session indicated that the new format was an improvement. Other reactions to the diagnostic and feedback procedures continued to be positive.

One of the significant components of the diagnostic and feedback procedures involves the comparison of ratings obtained by external observers with those of the command group itself. It was anticipated that as the interactions during the feedback sessions occurred, a consensus of what constitutes satisfactory performance would begin to take shape. Closure about a common standard should facilitate communications within the feedback session and provide an opportunity for the feedback session to focus more on possible solutions and less on the differences in perceptions of performance. Therefore, comparisons of the participants' ratings with those of the external observers were examined to see if this occurred. Table 16 presents the mean absolute difference in rating between each participant and his corresponding observer (evaluator) for the second CAMMS exercise and both integrated exercises. The anticipated trend did occur. The major shift towards a consensus appears to have occurred between the first two feedback sessions (i.e., CAMMS II and INTEG I).

Realism, Importance, and Difficulty Judgments. Following the second CAMMS exercise and both integrated exercises, the controllers, evaluators, and participants were asked to judge the realism, difficulty, and importance of each subtask listed in Table 2 relative to the minimum level in each dimension needed "to be of training value in any training exercise." The judgments were elicited using magnitude-estimation procedures.[5] They were incorporated into the exercise to help assess in detail the relative training benefits of the battle simulation and integrated environments. Although data were gathered after the first integrated exercise, the data analysis plan called for comparison of CAMMS II and INTEG II to avoid any biases in judgments that might result from novelty of the integrated format or a particularly poor exercise the first time

[5] Stevens, S. S. Psychophysics: Introduction to its perceptual, neural, and social prospects. G. Stevens, Ed. New York: John Wiley & Sons, 1973.

the format was tried. Judgments from INTEG I were, in fact, uniformly higher on all three dimensions and on almost every subtask.

Table 16

Mean Absolute Difference between
Participants' and Evaluators' Performance Ratings

	CAMMS II	INTEG I	INTEG II
BC - CH Eval	1.25	1.11	.40
S1 - S1/4 Eval	1.63	.63	.64
S4 - S1/4 Eval	1.50	1.11	.91
XO - S1/4 Eval	2.50	.80	1.20
S2 - S2 Eval	1.80	1.33	No Data
S3 - S3 Eval	1.58	1.50	2.05
FSO - FSO Eval	1.42	.50	.75
Average	1.53	1.00	.99

Table 17 presents the average ratings on CAMMS II and INTEG II for 13 observers (4 evaluators, 4 controllers, 5 players) who provided estimates for both exercises. A table entry "E" should be interpreted as "E times the minimum required in a training exercise." For example, subtask 2A for CAMMS II realism was judged to be 1.401 times greater than the minimum needed for realistic training. Thus, values less than 1.0 were judged to be, on the average, subminimum. Overall, there were no significant differences between exercises.

The expectation that the integrated exercise would be more difficult was not borne out by the data. Subtasks were consistently judged to be slightly more difficult in CAMMS II. This might be due to the fact that INTEG II was the third iteration of an attack mission over similar terrain. In the area of simulation fidelity, there seems to be some advantage for the integrated format in subtasks associated with information gathering and interstaff coordination. This is to be expected, since the integrated exercise permitted actual ground reconnaissance and since the battalion commander and S3 went forward during the exercise. The latter is standard procedure for coordinating an attack but rarely is played in battle simulations for obvious reasons. In both exercises, logistics play was substandard--a common flaw in current simulations of all types. The very low realism ratings for individual staff planning and developing courses of action in both exercises indicate that restrictions imposed to help control the test may have removed many of the staff's normal planning options.

Table 17

Comparison of Subtasks across Exercises

Subtask	Realism		Importance		Difficulty	
Task 1	CAMMS II	INTEG II	CAMMS II	INTEG II	CAMMS II	INTEG II
1A	1.352[a]	1.696	1.461	1.100	1.096	0.927
1B	0.961	1.259	1.487	1.459	1.556	1.343
1C	1.853	1.906	1.041	0.894	1.385	0.927
1D	1.028	1.027	1.244	0.995	1.429	1.110
Task 2						
2A	1.401	1.293	1.733	1.730	0.889	0.499
2B	1.216	1.696	1.405	1.357	1.234	0.994
2C	1.305	1.567	1.489	1.589	1.571	1.034
2D	1.302	1.744	1.262	1.520	1.156	1.071
2E	1.409	1.401	1.478	1.264	1.388	1.303
2F	0.904	0.666	2.128	1.487	1.576	1.255
2G	0.504	0.576	2.077	2.226	1.070	1.121
2H	1.445	1.998	1.320	1.716	1.085	0.937
Task 3						
3A	1.269	1.168	1.820	1.728	1.116	0.733
3B	1.370	1.502	1.053	1.132	1.597	1.122
3C	1.540	0.982	1.418	1.496	0.754	0.641
Task 4						
4A	1.265	1.115	1.931	2.104	0.631	0.656
4B	1.511	1.514	1.208	1.476	1.501	1.271
4C	1.214	1.105	0.906	0.796	0.978	0.946
4D	1.438	1.408	1.598	1.732	1.010	0.857
4E	0.969	1.147	1.813	1.649	1.645	1.034
Task 5						
5A	1.763	1.246	1.570	1.733	1.314	1.192
5B	1.404	1.433	1.394	1.261	1.247	0.744
5C	0.695	0.529	1.637	1.790	1.091	0.782
Overall	1.221	1.236	1.466	1.444	1.198	0.969

[a]Values are geometric means for 13 observers of the ratio of magnitude estimates to minimum values necessary to be of training value.

Table 18 summarizes the number of subtasks rated below minimum by each group (players, controllers, evaluators, and player/controllers; i.e., company commanders and FIST chief). It is apparent that these judgments depend heavily upon the point of view of the observer. The observers located in the ECC (controllers and player/controllers) were much more harsh in their view of the realism and difficulty of the exercise. Those located in the battalion TOC (evaluators and players) tended to view the realism of both exercises more favorably but differed somewhat in their perception of difficulty.

Table 18

Mean Number of ARTEP Subtasks Rated below the Minimum to "Be of Value in any Training Exercise"

	Realism[a]		Importance		Difficulty	
Evaluators						
CAMMS II	1.8	(5)	1.8	(5)	4.6	(5)
INTEG II	2.0	(5)	1.0	(5)	1.0	(5)
Controllers						
CAMMS II	4.1	(7)	1.1	(7)	5.3	(7)
INTEG II	5.8	(5)	2.8	(5)	9.0	(5)
Players						
CAMMS II	2.3	(7)	1.5	(6)	2.6	(7)
INTEG II	1.0	(5)	0.2	(5)	1.0	(5)
Player/controllers						
CAMMS II	3.0	(4)	3.0	(3)	9.8	(4)
INTEG II	0.0	(1)	0.0	(1)	0.0	(1)
Total						
CAMMS II	2.87	(23)	1.67	(21)	5.09	(23)
INTEG II	2.75	(16)	1.25	(16)	3.44	(16)

[a]Numbers in parentheses indicate the number of people responding.

The issue of differing perspectives among observers was pursued further. Table 19 shows that the inter-rater reliability for all observers was high for realism and importance, but that agreement on difficulty was substantial only in INTEG II. Looking at subsets of the observers, the evaluators show consistently good agreement on realism and difficulty of the subtasks, the controllers are consistent on realism and the players show reasonable intragroup agreement only for the second integrated exercise. The data in Table 20 show that agreement across exercises was quite high, though again the evaluators were the most consistent group. The two sets of results in combination indicate that the consistent perspective of observers across exercises on the relative realism, importance, and difficulty of the subtasks was due more to each individual's agreement with his prior judgments than to agreement with his group.

Table 19

Inter-Rater Agreement within Exercise
for Three Subtask Dimensions

Dimension	Exercise	All Raters (K = 14 - 21)	Evaluators (K = 4)	Controllers (K = 4)	Participants (K = 5)
Realism	CAMMS II	0.726**	0.490	0.558	0.243
	INTEG II	0.657**	0.514	0.386	0.575
Importance	CAMMS II	0.565**	0.252	0.204	0.046
	INTEG II	0.582**	0.566	0.156	0.424
Difficulty	CAMMS II	0.354	0.586	0.086	-0.456
	INTEG II	0.578**	0.566	0.252	0.454

Note: Intraclass correlations were computed using Ebel's formula with Snedecon's correction for missing ratings. Negative values result for F ratios less than 1. They do not connote an inverse relationship, but should be considered equivalent to zero for purposes of interpretation.

*$.01 < p < .05$.

**$0 < p < .01$.

Table 20

Internal Consistency across Exercises for
Three Subtask Dimensions

Group	Dimension		
	Realism	Importance	Difficulty
Evaluators	0.801***	0.805***	0.688***
Controllers	0.733***	0.357	0.412
Participants	0.573**	0.428*	0.141
All observers	0.837***	0.534**	0.599**

Note: Correlations are based on the means of five estimates for evaluators, controllers, and participants on 23 subtasks derived from the Battalion Command Group/Staff ARTEP.

*.01 < p < .05.

**.001 < p < .01.

***Zero < p < .001.

Table 21 shows the correlations among average judgments for the groups of observers. The agreement of evaluators and participants on realism ratings shown in Table 18 is reinforced here.

The correlations among dimensions of the subtasks, shown in Table 22, were computed to determine the extent to which the judgments were being influenced by a "halo effect" (an overall positive or negative reaction to particular subtasks). Clearly, these correlations are not large enough to support this explanation of the data. In fact, it can be argued that the only significant correlation, between realism and importance for CAMMS II, is what one would desire of a simulation, i.e., that the more important subtasks be the ones represented in the exercise with greatest fidelity.

A further consideration in determining the accuracy of the judgments is the extent to which they track with other data gathered in the exercise. Table 23 shows that, although the average performance ratings of evaluators are significantly correlated with the average performance ratings given by the participants for CAMMS II and INTEG II, neither set of performance ratings is related to subtask difficulty judgments in any reasonable way. The only significant correlation is in the opposite direction from what one would expect. This result cannot be explained in terms of the evaluators' grading easier on the hard problems, since the relationship exists for participant judgments of difficulty but not for evaluator difficulty ratings.

Table 21

Intergroup Consistency within Exercises for Three Subtask Dimensions

Exercise	Dimension	Evaluators versus Controllers	Evaluators versus Participants	Controllers versus Participants
CAMMS II	Realism	0.678***	0.783***	0.582**
	Importance	0.534**	0.351	0.166
	Difficulty	0.337	0.056	0.041
Integrated II	Realism	0.564**	0.477*	0.659***
	Importance	0.511*	0.025	0.025
	Difficulty	0.514*	0.261	0.242

Note: Correlations are based on the means of five estimates each for evaluators, controllers, and participants on 23 subtasks derived from the Battalion Command Group/Staff ARTEP.

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 22

Association within Exercises of
Subtask Realism, Importance, and Difficulty

Exercise	Dimension	Realism	Importance	Difficulty
CAMMS II	Realism	--	0.434*	0.011
	Importance	--	--	0.227
	Difficulty	--	--	--
Integrated I	Realism	--	0.308	0.383
	Importance	--	--	0.278
	Difficulty	--	--	--
Integrated II	Realism	--	0.350	0.089
	Importance	--	--	0.352
	Difficulty	--	--	--

Note: Correlations are based on the means of 15 estimates combining judgments from evaluators, controllers, and participants on 23 subtasks derived from the Battalion Command Group/Staff ARTEP.

*$p < .05$.

Table 23

Association between Judgments of Subtask Difficulty and Ratings of Subtask Performance

Exercise	Evaluator versus participant performance ratings	Participant performance ratings versus participant difficulty judgments	Evaluator performance ratings versus evaluator difficulty judgments	Evaluator performance ratings versus participant difficulty judgments
CAMMS II	0.540**	0.149	0.275	0.316
Integrated II	0.460*	0.203	0.156	0.471*

*$p < .05$.

**$p < .01$.

Discussion

The feasibility of integrating battle simulation and engagement simulation technologies was demonstrated for a battalion command group CPXing with CAMMS and a company team FTXing with MILES. The demonstration, and more importantly, the analysis which preceded it, permitted the identification of key information and control requirements attendant upon any attempt at BS/TES integration. The demonstration pointed out many problems that were not fully resolved and a few that might not be capable of complete resolution. In particular, the latter category includes the mixing of notional and live units and direct fire conflicts between them.

Training benefits could not be determined from performance in the integrated format. However, the opinions of the players, controllers, and evaluators about training benefits and related issues were gathered. Few consistent differences were noted in benefits for the battalion command group/staff. The differences that did appear generally favored battle simulations for command group training, though the training in the integrated format was considered satisfactory. It is not possible to determine the extent to which this preference is attributable to the particular implementation of the integration concept used in this test as opposed to inherent limitations in the concept itself.

Data on perceived training benefits for the live company were not gathered, but it is reasonable to assume that the opportunity to interact with a full battalion staff and to experience competition for battalion assets enhanced the quality of the company level FTX. This could have little impact on the decision whether or not to adopt the integrated format, since it would be uneconomical to use the entire battalion staff merely as a training aid for one company; for integration to be worthwhile, the battalion command group must derive training comparable to that obtainable in a battle simulation.

Requirements for Integration.

1. Information.

- Positive FM communications must be maintained for both controllers and participants. If the ECC is remote from either the battalion TOC/Trains area or the field exercise area, a retransmission capability should be provided. If either the field controllers or the FTXing participants have short-range communications gear, the following issues should be addressed: (a) relay/retransmission of the control net from the NCC to the ECC, (b) relay of the OPFOR control net to the ECC, (c) lateral communications between the notional company commanders in the ECC and the live company commander in the field, (d) communications for the live unit FIST representative with both fire direction centers and the battalion FSO, and (e) communications between the company trains (if played) and the battalion trains area. It would be desirable for the ECC to have the capability to monitor and record all nets used in the exercise. Similar considerations would apply to a brigade-level implementation.

- Information required from the field for control purposes is of two types: (a) casualty data and (b) unit location and posture (dismounted, "buttoned-up") for each coherent unit in the field (TOW section, tank platoon, etc.). The procedures for collecting this information should take into account the need for timely reporting to the ECC, but also, if done manually, the information transmission and processing limitations of the system. Automated position reporting and casualty reporting, available on some instrumented ranges, would alleviate many of the control problems experienced in this test but would probably not be available for home station training.

- The casualty data must be summarized in a form suitable for entry into the battle simulation computer system. Summaries maintained in a form suitable for later comparison with traffic on the A/L nets and with S1/S4 records would also be desirable for diagnosing the quality of reporting and recordkeeping. Unit location summaries at prescribed intervals, as implemented in this test, were not flexible enough to maintain an accurate picture of events during peak periods of the conflict. Again, automation could make the process much more timely for updating the representation of the conflict in the ECC.

- The information gathering and reporting system should be constructed so as to capture information for training analysis and diagnostic feedback. The CPX driver should keep records of conflicts, losses, expenditure of ammunition, and resupply and should summarize it in a form suitable for use in the feedback sessions. Automated entry and summarization of performance ratings should also be incorporated in the system to avoid extensive delays in preparing the feedback sessions.

- The situation analysis capability provided by the LOOKAHEAD program did not appear to be of value in controlling this exercise. Integrated exercises run at the brigade level may benefit from such predictions, however, since the pace of events is somewhat slower at this level and more lead time would be required to maneuver the OPFOR in accordance with the exercise director's plan and to react to changes in the maneuver battalion's course of action.

2. Control.

- The exercise director should be in overall command of the exercise. He requires direct communication with the chief field controller and the chief controller of the battle simulation. Mobility, such as helicopter transportation, would be a valuable asset.

- The OPFOR in the field should maneuver under the direction of the OPFOR controller in the ECC. He must also respond to directives from the chief field controller. OPFOR artillery should be integrated between the CPX and FTX portions of the exercise. These control requirements heavily affect the communications requirements for integration.

- Control may also be exercised through scenario development. Problems in mixing of notional and real forces and in overconcentration on the live unit may be partially alleviated using this technique. A detailed script for the exercise, including OPFOR contingency plans for all

foreseeable friendly courses of action, should be developed and tested prior to the exercise using wargaming techniques in order to insure that the unit is exercised in all areas required by the training plan.

- If necessary, administrative controls can be introduced by the exercise director through the chief controller of the battle simulation, who also plays the role of higher headquarters commander.

3. Policy Questions Impacting on Requirements. Several of the requirements for integration necessitate the evaluation of trade-off relationships between realism for the command group and for the live company, between economy and doctrinally correct training, and between control of the exercise and "free play" by the participants.

- Direct fire conflicts between live and notional units could reduce the realism of the exercise for units in the field and would complicate the control process. On the other hand, the scenario or administrative restrictions required to prevent them would tend to undermine the training value of the exercise for the command group.

  A compromise might be effected by introducing a few weapons systems under the control of the notional unit commanders to represent the notional units in the field and/or equipment to simulate the noises of these units. These skeleton forces might be allowed to simulate suppressive fires or even to inflict simulated casualties on the live OPFOR in accordance with battle simulation predictions of the results of engagements between the live and notional forces. Live-on-notional conflicts would be more difficult to arrange than notional-on-live conflict, since with the exception of the skeleton forces the live OPFOR would not be able to detect the disposition of notional units. Similarly, the live friendly forces would be unaware of the disposition of the notional OPFOR.

- Indirect fires do not present the problems with realism that direct fire conflicts do. However, the live units have no resources for target development against notional units. A trade-off that must be evaluated is the training benefit gained by allowing notional units to initiate artillery action against live units versus the problems that arise in controlling target development when notional units with perfect intelligence are allowed to fight live units. Modifications to the battle simulation to limit the intelligence available to player/controllers or to limit their use of it could remove this objection.

- Ancillary interfaces for TAC air, attack helicopters, air defense, A/L, mobility/countermobility, and specialized intelligence require the evaluation of trade-offs between economic factors and the value of training according to doctrine. Command and control training should emphasize the coordination of the total resources available at a given echelon in order to maximize the combat power generated at the critical place and time in the battle. Highly artificial limitations on the resources available to the commander reduce the level of stress and involvement of the staff and could cause the command group/staff to underestimate the true difficulty of their tasks. Similarly, failure to simulate the full range of OPFOR capabilities could produce negative

transfer of training to an operational environment. In the test, these ancillary systems were included in the notional battle but were not simulated in the field exercise. This helped stimulate staff involvement in the exercise, but created artificialities in the scenario that were noticeable in both the battle simulation and the engagement simulation. Simulation of these capabilities in an FTX would be prohibitively expensive in most training situations, the National Training Center being the only likely exception.

Training Benefits. The prototype integrated exercise system developed for this test provided an initial opportunity to explore the utility of merging battle simulation and engagement simulation technology. The determination of training benefits associated with the integrated system is based upon the perceptions and experiences of the controllers, evaluators, and participants as well as the observations of test directorate personnel. A true determination of the training benefits associated with the integrated system requires a more extensive research effort than was possible in this test. In particular, actual changes in performance that result from training in the integrated format should be examined. However, the opinions and observations gathered in developing and implementing the integrated concepts provide insights into the potential benefit of such a system and identify areas needing future developmental research. The discussion of the training benefits of the integrated exercise system will be divided into three parts: (a) the capabilities of the integrated system, (b) the limitations or constraints of the integrated system, and (c) a preliminary comparison of these capabilities and limitations in the CPX and FTX environments.

1. Capabilities of Integrated System. The integrated exercise system provided a mechanism by which the battalion commander and his staff, company commanders, and one company team within the battalion could be trained simultaneously. This concept could also be implemented at a higher echelon such that a brigade commander and staff with one battalion train simultaneously. Participants received training in ARTEP tasks related to command, control, and communications, as well as in some tactical areas.

The integrated system forces the kinds of interactions that are necessary to adequately perform a mission in a field environment: the live company commander experiences the impact of on-the-ground visits from his commander, while the battalion commander and staff must react to requirements of higher headquarters and work in concert with adjacent units. The integrated exercise system also took advantage of current innovations designed to relieve the control team of routine casualty mediation and data collection requirements. These technologies increased the acceptance of the battlefield outcomes and negated many of the arguments concerning casualty mediation often raised during field training. In addition, the advanced technologies provided a means of capturing performance data and battlefield event data for diagnostic and feedback purposes.

2. Limitations of Integrated Exercise System. Associated with the integrated exercise system are several training constraints or limitations that should be addressed. Artillery, close air support, and attack helicopters had limitations placed on them by the realities of the field training environment. Perhaps the biggest problem associated with the integrated exercise system is the constraints that may be placed upon the participants to provide an adequate

and realistic training exercise. That is, there may be a need to limit the options of the battalion command group concerning tactics and resource utilization. These restrictions are driven, for the most part, by the problems associated with controlling such an integrated exercise and probably lessen the training potential of such an environment.

3. Comparison of Integrated System with CPX and FTX Environments. The test plan called for examination of command post exercises, integrated exercises, and a battalion field exercise. While systematic data were collected on the first two training environments, it was not possible to do so for the field exercise. Therefore, FTX comparisons are based upon insights and analyses that developed during planning for the test.

In some areas the integrated exercise provided greater realism than the battle simulation; in others, the reverse is true. The integrated exercise provided the added dimensions of haphazard movement rates, equipment failures, communications gaps, and similar random events that are not typically well represented in battle simulations. On the other hand, many of the combat support and combat service support activities that lend intensity and realism to a CPX were poorly represented in the integrated exercises and would be expensive to incorporate in any integrated effort. Furthermore, the constraints placed upon the command group to prevent mixing of live and notional elements distorted their planning and decisionmaking processes, thereby reducing the training benefit of the exercises. The overall training utility perceived by the participants was greater in the CPX mode, but firm conclusions in this area should be based on performance data rather than attitude surveys.

The integrated concept may be of greater merit than a battalion task force or brigade field exercise, since the integrated effort is cheaper, can be performed in a smaller training area, and may be no more difficult to control. The training benefit may be as great or greater than that achieved in an FTX, since a wider variety of resources can be simulated. Furthermore, the integrated concept provides an opportunity to exercise defensive missions against a realistically large OPFOR, while equipment and personnel requirements would be prohibitive for an FTX.

Future Research. From the experiences of developing and testing the integrated exercise system, the following implications for research and development were identified:

1. An integrated exercise at the brigade level which has the battalion as the live unit in the field should be developed. It is anticipated that many of the control problems encountered during this exercise, such as mixing of units, would be lessened in a brigade-level integrated exercise due to the typically less interdependent operation of battalions. It is further anticipated that the payoffs would be greater than the expense of fielding a brigade.

2. The training benefit of the integrated system should be assessed in a controlled study involving the use of comparison training systems and the measurement of changes in performance for all echelons in the task force.

3. Data on movement rates, equipment failures, communications disruptions, and distortions found in field exercises should be collected and incorporated into battle simulations to increase the fidelity of the training environment.

4. Battle simulation programs that more closely represent the degraded intelligence and "fog of battle" problems associated with the field environment should be developed to provide the player/controller with appropriate information.

APPENDIX A

CAMMS CONTROLLER TRAINING COURSE

During the controller training course personnel designated as controllers are taught aspects of their positions and the organization of the control facility. It should be understood that controller responsibilities in a CAMMS exercise are not significantly different than those of controllers in traditionally run command post exercises. Controller responsibilities include but are not limited to the following:

1. Represent commanders and staff of higher and adjacent headquarters and other elements not playing the exercise.

2. Provide information that cannot otherwise be developed.

3. Interjection of situational data that causes player elements to react.

4. Maintains objectivity by insuring that neither an unrealistic accumulation of combat power nor unrestricted use of it occurs.

Chief Controller

The chief controller is responsible for the overall CAMMS exercise, both the control facility and the player area. He should be the senior controller present. Perhaps his most important function is to coordinate with the unit commander being exercised concerning the training objectives he wishes to have observed or stressed during the exercise. He arbitrates major decisions affecting the exercise such as:

1. Differences between US and OPFOR controllers.

2. Situation specific questions or problems not otherwise covered.

3. Resolution of critical variables such as time distance factors-commitment of reserves-orders from higher headquarters.

4. Lends his experience and professionalism to other controllers to enhance realism, objectivity and real life situations.

Table Umpire

The table umpire is the chief controller's principal deputy. It is his responsibility to exercise overall supervision over the control facility and all operations conducted therein. Several of his more important functions are as follows:

1. Operation of the control board.
2. Supervision of the CAMMS control register.
3. Supervises posting of the control board with graphics and unit counters.

In order to insure neither side takes an unfair advantage, the table umpire requires the OPFOR post their side of the control board first. The friendly forces must then be deployed based on the commander concept of operation. The table umpire must then observe both forces to insure the posting procedure is done according to deployment prescribed and not in response to what they see on the board.

During the exercise the table umpire arbitrates any disagreements between table controllers concerning line of sight between units, terrain types and or tactical decisions which impact on the situation. Accordingly, it should be obvious that the individual occupying this position should be senior in rank to the other controllers and possess considerable tactical knowledge. It should also be obvious that the table umpire and chief controller coordinate to insure the control facility is operating in support of the training objectives noted by the exercise unit commander prior to the exercise.

US Table Controllers

The duties of the US table controller applies not only to the company commander but also to the fire support team chief and XO/1SG. These individuals must wear two hats while he performs the following task. As a player (1) maneuver his forces IAW current doctrine, (2) "fight the battle" on the control table, (3) follow his unit SOP. As a controller:

1. Graphically display tactical scheme as per OPORD.

2. Task organize as per OPORD.

3. Label units with the appropriate operation code.

4. Prepare appropriate forms for interface with the computer.

Obviously, it is necessary for each individual to accomplish all the items listed; however, each person must be capable of doing each task so that the exercise is not interrupted.

The company control cell must take orders from the battalion command group, organize their forces and attempt to execute their mission against the enemy realistically. They should be aware of how to use assigned assets and request other assets as required by the tactical situation. They must visualize the battlefield and portray this via communications to the commander and his staff.

OPFOR Controller Duties

The OPFOR controllers have the same tasks to perform as the US table controllers. It should be noted however that OPFOR controllers do not have to report combat results to higher headquarters because an OPFOR staff is not played in CAMMS. Additionally, resupply action of OPFOR units must be closely monitored by the chief controller. It is important for all controllers to understand that this situation is an open and free play game. All activities which occur in the CAMMS control facility should be an interaction between OPFOR and US table controllers to insure objectives of the exercise are accomplished. There is always a tendency to start making decisions for the command group and fight to win on the control board. This activity should be stopped and controlled by the table umpire and chief controller. Cooperation at the control board will result in a realistic picture being drawn for the commander and staff.

Fire Support Controller Duties

This controller and his assistants are responsible for playing all artillery normally available to the unit conducting the combat operation. They should establish the equivalent of a FDC which will receive, process, and fire the missions for the FIST CHIEFS operating at the control board. Obviously, this FDC will not operate like a "real" FDC in terms of computing data but, would "sound" like a real FDC and respond in similar fashion concerning time and procedures. This provides information for fire support officers at battalion and brigade to monitor in terms of ongoing fire missions, as well as a means to plan future operations an additional function of the FDC is to slow down the rates of fire to within the capabilities of the weapon systems conducting the fire mission. This is important so that the players do not get the idea that artillery works like a fire hose.

Tactical Air Controllers Duties

Ideally this controller should be an air force officer. Active army units may use their FAC's or request support from the USAF FAC pools at Shaw or Bergstrom air force bases. Reserve component units may request support from local air guard units. The tac air controllers insures the proper number of airframes and the proper weapons before providing input to the terminal operator. He responds to tac air request within the sorties allocated by higher headquarters.

S-2/G-2 Controller Duties

While all S2/G2 functions are important, it is essential that this controller insures there is an adequate intelligence build up. Anything less puts the player-commander and his staff in the unenviable position of not having information for planning purposes. This is particularly true at

battalion level. In many cases it may facilitate the game for the S2/G2 controller to prepare a list of intelligencereports and indicators that will provide the player commander and staff the necessary intellignece to do planning and any last minute changes so they are prepared to meet the enemy threat in the best possible disposition. If the S2/G2 controller does not provide timely, accurate information and intelligence, the CAMMS exercise may rapidly degenerate into one big fire fight in which the friendly forces have no way of survival. The S2/G2 fulfills his responsibility by insuring he accomplishes the following areas:

1. Represent all intelligence staff functions of higher and adjacent headquarters as wll as other sources.

2. Keep abreast of tactical situation.

3. Adds realism by generating intelligence information and requirements.

4. Prepare a collection plan-levy requirements to player units.

5. Insures unit SOP is followed.

6. Checks flow of info/intel by injecting data at various levels.

S3/G3 Controller Duties

The S3/G3 controller performs those functions of the exercise units next higher headquarters. In this capacity he is responsible for providing the following:

1. Represent all operational and combat support assets of higher and adjacent units.

2. Briefs and distributes the Division/Brigade operations order to the playing unit.

3. Maintains a situation map and keeps abreast of ongoing lanned tactical operations.

4. Generates normal operations information, guidance, orders, and requests.

5. Exercises discretion in providing combat support to preclude unrealistic accumulation of combat power. In addition to those duties listed above, it should be understood that the S3/G3 controller must coordinate closely with the chief controller in determining those assets that should/would be released to the player unit. It is essential that no assets be given the player unit without approval of the chief controller. Anything less that this could jeopardize the exercise and more importantly, give the player group the idea that they have an unexhaustable supply of assets to utilize in an actual tactical situation.

G1/G4 Controller

The G1/G4 controller has two critical functions, first, controlling all input to the administrative and logistical terminal, and second, establishing and controlling administrative and logistical constraints for player units during the exercise. During the exercise, units will request resupply or redistribution from higher or adjacent headquarters. It is the ALOG controller's decision to approve part, all, or disapprove the request. There are two methods of resupply. One is to resupply by percentage up to 150% of TOE. The other being the most common way of resupplying, by individual items of equipment ammo, POL or personnel. The percentage type of resupply places the unit at a specific percentile level straight across the board. In other words if you put a unit in at 80%, they have 80% equipment, ammo POL, and personnel. This type of resupply allows for easy top off of vehicles and resupply of ammo by putting the units in at 100% of ammo or POL.

It should be obvious by now that CAMMS is a control group dependent simulation. Simply stated, a CAMMS exercise is no better than the control

group controlling it. The commander has the option to make adjustments to the control staff, but he should realize that cutting too many qualified personnel from the control group will have an adverse impact on the validity of the exercise.

APPENDIX B

BATTALION COMMAND GROUP EVALUATION TEAM DUTIES

Battalion Command Group Evaluators

- Review all assigned tasks, conditions, standards and observable events.
- Expand/modify observable events.
- Coordinate with controllers to determine when and where events are likely to occur and likely appropriate responses.
- Observe Bn Cdr and staff performance during exercise.
- Coordinate with controllers on a continuous basis in order to identify key events.
- Record observations/ratings on forms.
- Hand in all rating and data collection forms (including self ratings of Bn Cdr and staff) to ARI representative.

Communication Data Collectors.

- Insure that all commo monitoring equipment is operational and sufficient data collection forms are available.
- Insure that appropriate commo nets are being recorded on audio tape equipment.
- Monitor each assigned net for 15 minutes every hour.
- Record on collection forms the communications data requested.
- Summarize data (i.e., tally frequency) for each aspect of the data for each hour of the exercise.
- Summarize data for entire exercise.
- Provide summary results to senior evaluator.
- Hand in all remaining data to ARI representative.
- Shut down all equipment.

APPENDIX C

PROGRAMS OF INSTRUCTION FOR CONTROL AND EVALUATION

CAMMS Controller Training (20 Hrs)

1. Introduction

   - What is CAMMS
   - Interface with computer through CAMMS Forms
   - CAMMS Controllers and Controller duties

2. Practical exercise

   - CAMMS Terminal Operator Instruction
   - Player/Controller duties and responsibilites

3. CAMMS practice exercise

   - Use of CAMMS Forms
   - Use of CAMMS generated information
   - CAMMS play incorporating all controller, player/controller participants

Controller Training (Diagnostic/Feedback Phase)

1. Introduction
   - Need for diagnosis
   - Bn Cmd Gp ARTEP
   - General comments on feedback

2. Schedule of events
   - Cmd gp training
     - First training session
     - Second session
   - Summary of other events

3. Diagnostic/feedback package
   - Observation/evaluation procedures
   - Feedback procedures

Data Collector Training (4 Hrs)

1. Introduction
   - Purpose of test
   - CAMMS
   - Commo nets

2. Schedule of events
   - Cmd Gp training
   - Integrated BS/TES Test
   - Field exercise with exercise management system
   - Field exercise

3. Data collection package
   - Format
   - Clarification of terms
   - Review of TAC SOP, CEOI (call signs, brevity codes)
   - Procedures
   - Application

Evaluator Training (8 Hrs)

1. Introduction

   - Purpose of test
   - CAMMS
   - Bn Cmd Gp ARTEP

2. Schedule of events

   - Cmd gp training
   - Integrated BS/TES test
   - Field exercise with exercise management system
   - Field exercise

3. Measurement package

   - Format
   - Clarification of terms
   - Procedures
   - Application

APPENDIX D

COMMENTS ON CAMMS CONTROLLER TRAINING COURSE

1. Controller Manuals.

I don't feel as if a controller could do both air and artillery effectively. Definitely need two individuals.

Much better manuals than previously. Three days of training was much too long. Experience in our unit has shown that four hours conducted within forty-eight hours of STARTEX is more than sufficient.

2. Controller training.

Problem with ammo, POL resupply vs. actual field conditions, (i.e., drop 10 rds of main gun ammo at 1st Platoon - how to input it).

Need to have a form drawn up for FSO controller to keep track of firing units, call signs, rds/tube, tubes, msns, fired, etc.

3. Mini exercise.

We should have one more mini exercise on a subsequent day.

Needed Bn staff for mini exercise.

Because of the short length, I wasn't able to interject as many battle events as I had planned - wasn't complete - could have been made a more useful exercise.

I have been called for six days, however, only actually used one. Positions necessary for only certain days.

Not long enough to get involved with generation of reports.

The mini exercise was too long and poorly organized. Two hours would have been sufficient if it had been organized.

4. Overall.

Too long for the desired results. Two hands-on sessions would be adequate to train up all those concerned.

OPFOR controllers need to be extremely well versed in threat doctrine. Had I not played this game and been given adequate threat instruction at Ft Knox, I would not have been able to perform my function.

5. Changes, additions, deletions.

I don't believe I will be able to fulfill computer training - but general use of forms and procedures - yes.

Delete classes, go to hands-on (dead horse). Add 1/2 to prep time for the after action review.

The artillery to be effectively used needs more personnel to act as FIST Chiefs, FDC's; we need two radio nets - one for FDC fire missions, one for planning and coordination.

Separate EW controller.

The program has to be updated. Weapons system results have to have a semblance of reality.

More complete rundown on unit resources required.

Data base needs to be updated to match current threat forces.

Shorten the training session. It doesn't require two; six hours would suffice.

6. Problems encountered.

An Army air controller should be part of the control/player package to provide the required expertise. Company players would learn from this expert.

I found myself getting caught up in the exercise trying to play Bde FSO, and all of the S3's, and all of the FDC's. This made it more difficult to act strictly as a controller and to be able to affect the battle to the extent I feel a controller should be able to do.

Had to split my efforts between S2 and EW.

Couldn't see all the actions or keep up with all reports/actions - CMD/ Intel/FSO/Air Nets.

Because of inadequate visualization of flank action, the OPFOR was forced uncharacteristically to withdraw from a terrain feature that would not have been normally relinquished.

Employment of attack helicopters and the outmoded TO&E of the OPFOR, i.e., TGZs, no attack helicopters, no DP-ICM, and minimal artillery (especially MRL) effects.

The unit commanders must remember what role their unit is in, i.e., attack or defense.

Conflict with attacking and defending additions. Data base will only allow for the initial battle input. Can be stopped by deleting all and initiating new conflict but I was unaware of the problem prior to its encounter.

Computer lag time caused numerous and at times critical problems for realistic game play. Computers are not responsive to a fast, free flowing game.

Computer delays of up to an hour resulted in untimely reports which clogged the net at some time. There were large gaps where no radio traffic went out for a 1/2 hour to an hour. Also, the computer personnel were not sure as to who the attacker was in a counterattack which in my case, resulted in me having to submit three different inputs on the same engagement - but it took 20 minutes to find out that the computer or chief controller wouldn't accept the cards as filled out to controller specification.

7. Additional comments.

The artillery program is very discouraging to use, and I don't feel that it is valid. The artillery should be able to wound and kill more personnel and occasionally create either a catastrophic or operational loss.

I believe intelligence officers, friendly controllers, commanders and staffs can gain immense benefits and lessons from a realistic portrayal of OPFOR. At the present time, CAMMS presents a bastardized picture. Over the period of the last three years, I have recommended frequently adaptation of the simulation to reflect the reality we are trying to educate the soldier with here in Europe. Other simulations provide more accurate, realistic training for all concerned on the table and in the TOC.

Personnel utilizing this simulation as a training exercise must understand that the board play is merely a device for generating reports that drive the staff actions. Board play and "who wins the war" are not as important as the evaluation of the way the unit goes about its staff actions. There needs to be more cooperation between table players/controllers in recognizing that objective.

Pegasus does the same thing better and for less money.

APPENDIX E

COMMENTS ON CAMMS DIAGNOSTIC FEEDBACK PROCEDURES

Rating form should only reflect those tasks applicable to the type operation, i.e., attack, defend, retrograde, etc.

It is a little too "conceptually" written for my tastes - rather vague - I sometimes wondered what you were asking about. Also, its not feasible for S1/4 to answer S3 related questions in such detail (i.e., many of "all" type questions).

Need more subtask breakout - more specific

If organization of the task were by duties of the evaluators.

Need more subtask breakout - more specific.

For Bn FSO on Task 2G5 (Develop a plan based on mission and modify it as required by events), "Passing of enemy intelligence/forwarding battlefield information" needs to be added to observable events. Reason: This is one of the primary missions of FIST.

Some subtasks are hard to understand.

Reference Tasks 1B and 1C - It is impossible to "determine what information is available" without determining what information sources are available.

2B should be before 2A.

Reference 2C - Key terrain must be taken into consideration when developing the plan and OPORD. However, it should normally not be listed in the OPORD.

Reference 2F - What is the definition of critical place? An area void of enemy is a critical place if your mission is to rapidly take a deep objective.

Task 2H should be divided into two tasks. First sentence of 2H is separate from second sentence.

In some cases, the observable events do not apply at the level we are playing.

Subtasks that do not apply should be deleted.

Modify so there are separate sections for each position for evaluation of performance.

Delete communication requirements from S2.

A more specific breakdown of each subtask into duties, responsibilities, tasks critical in a given duty position but leaving room for ingenuity and initiative.

Staff areas need to be more defined - admin/log has little or no intel input. Make admin/log packet and expand based on Controller's Instruction Book.

Wordy, verbose, complicated, too long. KISS = Keep it simple stupid! After a whole day of playing this game, I've no inclination to read anything as lengthy as your directions; brevity is not only the soul of wit, but also the key to attention!

Lack of knowledge in one of two areas makes the diagnostic procedure one-sided.

Some coordination among staff members took place after hours. This was discovered during feedback session.

Controllers should write all scenarios so as not to influence evaluators.

Too much time wasted to fill out forms.

The "how do you rate yourself" form has only limited value, I think the idea of balancing it against the controllers is better accomplished verbally at our afteraction interface.

Prepare packages tailored to individual staff sections.

Realize staff needs an overall evaluation - however, each staff position has different emphasis - admin/log evaluation needs a lot of subjective additions to cover obvious problems.

Need more explanation on where the form go - how critique is to be conducted.

I had to wait from 1330 until 1630 to get the questions. A ridiculous waste of time.

Wordy, verbose, complicated, too long. KISS = Keep it simple stupid! After a whole day of playing this game, I've no inclination to read anything as lengthy as your directions; brevity is not only the soul of wit, but also the key to attention!

Needed more time to rate and discuss the rating with individual to identify weak areas and obtain their solutions.

Evaluators could use more time to talk over the task to check if the interface took place.

I like the after-action get togethers. Excellent feedback, professional.

Initially (1st Iteration), it (feedback) was questionable.

Feedback must create learning and not present an unclear atmosphere.

I really feel positively about the sit down sessions. They're as (or more) important as the games themselves for an S-4.

There is a real need for a controller and/or evaluator in the game room and field location.

Portrayal of situation was not as easily discernable as controllers pictured (too much misleading).

CAMMS personnel not initially involved in Cmd-staff relationships. Will not see all that takes place.

Not as personal, more comfortable and receptive.

Quantum leap.

No verbal later.

Observer was in a good position to comment/suggest improvements.

I learned a lot in the first session and implemented new ideas.

Having both controller and evaluator there (i.e., job separation), helpful.

I think having a controller in both the CAMMS buildings and the TOC provided for a more effective evaluation of the exercise and duty position. The player/controller was helpful.

By wearing so many hats, I (FSO controller) did not feel as if I did any of the jobs as effectively as I would have liked to.

Controllers need to control only and not evaluate. An exception to that would be on specific areas they can observe, i.e., reporting.

APPENDIX E

COMMENTS ON FIRST INTEGRATED EXERCISE

Information Flow

1. The command net is over crowded with the playing problems of the net CMDR or NCS. What is intailed is a separate net of control for OPFOR, friendly and NCS to CAMMS site to minimize information on firing, kills and location of force for reporting on a 15 minute basis. Actual events on the ground as they relate to play at CAMMS to learn mistakes made there instead of what a make believe senario will say.

2. Radio Communications: Too many controllers and NCS's on the same net trying to pass firing and kills, and location and situation reports at the same time. Recommend two separate nets; one for normal controller firing and kills reports and one for location and situation reports. NCS not receiving transmissions, recommend either the NCS be equiped with a ARN 292 antenna or more effective use of high terrain be used for stationing the NCS transmitter.

3. Controlling of two tank elements: Tank platoons are divided into two elements, heavy sections and light section, and are designed to operate at a considerable distance from each other; therefore, a controller, dispite knowing the basic plan and using advantage points, does have some trouble in controlling two elements and may not be available to observe an encounter with an enemy force. Recommend two controllers, one for each section, per platoon.

4. The CAMMS board game suffered from not having exact locations of the unit in the field, so as a result updates would find units (enemy and friendly) too close i.e., they should have spotted each other sooner - we need timely and accurate updates.

5. This is my first time as countermover. Controllers on the ground are not keeping me updated with what is on the ground.

6. Poor reporting by NCC - Insure the platoon controller report kills/casualty accurately and in a timely manner.

7. Live OPFOR and blue forces need to give up-dates on movement and conflicts continually.

8. CAMMS exercises staff, exercising staff requires an accurate flow of information flow. Integrating CAMMS with an FTX slows down the information flow and thus decreases the potential training value of CAMMS for the staff. Integration defeats the purpose of CAMMS.

9. First we were not able to develop positive operational spots for the NCS. This resulted in broken communications, and thus, lost information.

10. Communications - partially due to poor location, but also due to extensive net traffic, we had many serious commo gaps. Solutions - stations in the control net must be limited to MILES controllers only. Others may receive but not transmit. OPFOR command net must be limited to the OPFOR elements. That net is for elemental use, not controllers. Use of that net by others only distracts the OPFOR from the mission. That leaves the CAMMS with no net to contact MILES elements with, however, by adding a net into the NCS (NCC) they can generate input indirectly into the MILES play. If that is inadequate an additional net could be added to the senior controller, and/or the OPFOR controller to initiate input.

11. More effective link with ground players to CAMMS. Better movement and reporting by adjacent notional units.

12. MILES controllers must talk to CAMMS controllers.

13. Communication effectiveness was limited since the controller had to operate on both the OPFOR and FIST net. There should be one more additional net for the controller (Bde FSO) and TFFSO to coordinate, pass information, etc., in order to leave fire nets open. A controller needs to be present on the ground whenever possible, when an artillery simulator or smoke pod is used in order to assess damage or effectiveness. I did not receive any feedback in this area. There needs to be an FDC involved that can receive all fire missions, assign units to fire volume. (Currently there is not).

14. Better link needed between group OPFOR and CAMMS OPFOR.

15. Communications - central control of OPFOR.

Control/Coordination

1. Interface of real OPFOR with board OPFOR. Solution - Establish a "Mine-CP" in field for control of OPFOR and tracking of real blue force unit and orders from Bde CP to the unit.

2. Use of notional units on the board to reinforce or secure key terrain for MILES unit (Although realistic in war) is unrealistic for MILES play. Solution - Clear sep ration of notional and real units.

3. The fires of the MILES FO were not put on the board. I believe that this was done because their fires had no effect on the computerized game. To integrate the CAMMS and MILES both must effect the play of each other both on the ground and in the computer.

4. FSO controller cannot adequately keep count of the number and type of rounds fired by the live unit unless they announce a complete MTO every mission.

5. It was difficult to try to keep the two games separate yet integrate them i.e., the board players were not to fire on the live units (represented on the table), yet we were supposed to be able to keep track of them. Only recommendation would be to play the game more.

6. The XO for the real company was not reporting on A/LOG net to the S-1 and S-4. He should not be utilized as a gunner, rather he should do the XO's real job. Monitor and report on the A/L net to the S1/S4; both losses and requests. If he does not do exercise as an XO, there is no way for Bn to know what is happening on the ground. The unit must exercise real supplies on real vehicles to player units. This will make it difficult to interject administration problems into the CBT Trains, but it is far better to exercise the whole unit.

7. Notional and live units became mixed on the board. The live units were not able to shoot at notional or visa versa. If notional and live units are to be integrated they are going to have to designate specific lanes for the live and notional units to maneuver in and hold the units to their lanes. The only problem with this is it would limit the free play of both live and notional units and would limit tactical decision making processes on the part of the Bn TOC.

8. Real vs notional players - Cannot achieve realistic assessment and what would occur, need to establish set boundries for real units - but this is unrealistic. XO of live unit should set up here in facility to provide input to S4.

9. The live OPFOR must receive directions from the game facility to move rapidly from section to section to remain in front of live company thus eliminating the notional vs real conflicts. Board players must work out unrealistic arbitrary moves of notional units to cover holes caused by maneuvering live OPFOR in front of live blue forces.

10. The point of the integrated exercise was defeated from the start because so called "notional" units could not report to "real world" units and visa versa. So we drove through each other and ignored each other and generally the exercise was pointless to that extent. This is not to say that I don't appreciate the problem of setting it up.

11. A lack of coordination existed between the "live" players and board players. The lack of coordination was a result of the difference in "live" movement versus board movement. The game (CAMMS) was bastardized to facilitate "live" movement play. This is a large overhead for a small amount of gain. Initial coordination (radio) was quickly resolved. I believe that eventual evolvement of the system will allow for more coordinated play in the future. A lane or sector for live company would facilitate "live" maneuver and notional movement being timely and tactically sound.

12. The player on the ground cannot see notional, friendly or enemy elements which would obviously effect his actions. Notional and actual units cannot engage one another and this causes unrealistic actions by all involved. Suggested solution - do not integrate CAMMS and actual play. Integration is only a distractor from realistic training objectives.

13. Effective control and coordination between the CAMMS OPFOR and the real world OPFOR was never accomplished. This led to unrealistic adjustments

and somewhat false doctrinal portrayal. The OPFOR platoon should be directly responsive and under the control of the OPFOR commander. He should also report to him via FM. What it appeared was going on was that two different exercises were in progress and there was little or no control/coordination between them.

14. As the OPFOR controller, I and my forces, were required to develop fighting positions on the move, and extract to them without knowledge of our routes. This was only a minor problem, but realistically OPFOR battle positions should be developed all the way back, and routes coordination, allowing us at least one day on the ground before problem execution.

15. Ground verses board results - they are totally incompatible, OPFOR on the ground decisively engaged and detected two company teams. This was not reflected on your overall board. Perhaps a point on equilibrium exists inbetween. (High ground on desert terrain can probably see 2K).

16. Two separate battles were being fought: MILES forces and the notional forces. There should be a possibility for the real blue forces to engage the notional OPFOR and for the notional blue forces to engage the real forces.

17. A&L play was not integrated. The real company had no XO or commo on the A&L FM net. There should be real Admin log play for the real company.

18. Task force and S3 focused on one team in the field too much -- too much over supervision. Recommend you put the whole task force in the field.

19. Fire net was used for Admin traffic, i.e., CFC FCT etc., and interfered with firing and fire missions. Add one more capability at the commo facility for a radio to simulate the DS Bn CF net.

20. The exercise must be structured to avoid actual player pieces being engaged or observed by board players.

21. Manuever company absolutely needs XO. XO must have some kind of realistic supply consumption rate (computer interface?).

22. OPFOR control be under one person who is located around CAMMS map with radio contact with asst OPFOR controller on the ground. PROVIDES: 1) Single control, 2) realism to tactics, 3) coordinated exercise, and 4) board to ground exchange.

23. There were two totally different battles - notional and real and there was no integrated at all.

24. Notional unit (on board) attacks through objectives; unit on ground passes over same terrain and is engaged by OPFOR on ground. Coordination between table and ground must happen.

25. No XO for TMC.

Miscellaneous

1. When reconstituting forces that killed forces have to be brought back to "life." Action of play will not always allow time or place due to controller emphisis on staying with players still "alive in actual playing status." If contact is made while reconstituting it cannot be completed due to these responsibilities are complete.

2. Insufficient time for MILES controllers to check equipment, AAR, and attend CAMMS debrief and AAR. Allow more time for MILES Post training activities. In an MRA real MILES units have problems with safety maneuver damage.

3. FO's used the board instead of using Bn S2 to develop targets. 81mm mortars were rarely used because FO's and CoCdr's saw that they would have little or no effect on the battle.

4. The Bn FSO has communication problems with the live FIST chief player - recommend he use a 292 antenna.

5. I can only speak from the viewpoint of an artillery officer in that it seemed artillery effectiveness was somewhat lacking; however, the simulation overall was very effective. I would not believe the 1655 artillery rounds of various calibers would be fired in shows in actual combat however (re-supply would be different) in an engagement of the size that was played.

6. Artillery was ineffective, I suggest that the ratio of kills be higher. Example: a battery of one round killing one person; btry 2 rnds kills one and wounds one. For a battalion of one round, it should be 1 vehicle killed. We shot 1655 rounds which amounted to 5 killed and two trucks killed. This is absolutely unreal. It should be 5 to 6 times that amount. Also, we should have had use of chemical, ICM White Phosphorus, and Mine-Carrying Rounds.

7. Inadequate recon time - MILES controls were given the exact lane and active battle positions very late on the afternoon of the 25th. This perhaps was the biggest problem due to its affects.

8. The need to be physically at different locations at the same time. Radio is not the answer. Recommend more evaluators.

9. Accuracy - artillery effects were unrealistic.

10. Game time is too short to properly perform mission.

11. Only because controllers/evaluators are professionals with other people it could be devastating.

12. ARTY: Terrible feedback (software-program), unrealistic. Movements: Constrained to speed dictated by computer - unrealistic. First battle, Pegasus - more realistic. A/L ?? - first we must resupply one hour into game, then two weeks, not at all. BOTTOM LINE: 1) CAMMS is too expensive for what unique results it rendors. 2) CAMMS is unrealistic in its constraints - i.e., a unit is in contact (Hinds vs tanks in open); woodline is two meters away; computer dictates the unit can only more @250 mt/hrs. Results of ARTY = therefore teaching bad habits. 3) Integration is possible with certain model changes. But is it worth it? NO-The TOC could be exercised with 1/10 the overhead/cost. 4) SHELVE CAMMS until it becomes more realistic than other BS games and is worth ($) the expenditure.

13. This is my third iteration. I really think it is great to be able to wait for three hours after the end of the exercise to fill out these forms.

14. No realism in a printout with only numbers of NCO's/KM's. It's too much work for an XO to handle all the reports at his level. He should have the platoon leaders requisition to him. Also, the XO should have to requisition for each tank, just the PLT.

APPENDIX G

COMMENTS ON SECOND INTEGRATED EXERCISE

Information Flow

1. Poor reporting procedures. Bn net would give a location of unit that was different than the controllers.

2. Communication with the maneuver units was poor, probably due to the weather.

3. The presence of a coordinator in the game facility acting between the OPFOR in the facility and in the field worked much better.

4. A solution for integrated is to have a person with the live OPFOR with a direct net to the CAMMS site.

5. By co-locating the NCC and CAMMS elements in the same facility, it was considerably easier and faster to provide current friendly and enemy information to the CAMMS board. The NCC situation report is still too long and cumbersome. Maneuver controllers are hard pressed to remember to file their report on a scheduled basis. It would probably be simplier to have them send SPOT reports on locations, movements, contact, and kills as they occur. Would eliminate a good deal of traffic on the control net. The addition of the senior controller/CAMMS OPFOR controller net also allowed for much better control of OPFOR and the effort of adjacent units on that live OPFOR.

6. Radios could have been in better condition. The format itself was good. I would suggest a "message" area. Other than that the format was good.

7. Radio could have been in better condition. They could have sent the messages a little slower than saying it so fast that you cannot understand.

8. Unit maneuvering on ground was occupying terrain that was shown on the board to be occupied by OPFOR.

Control/Coordination

1. Movement is not realistic - too slow. Real force vs notional force not realistic. Bn Cdr knew what he wanted to do with a notional unit by-passing a real one. This cannot be done realistically. System of having MILES controllers in CAMMS site will work. Keep real forces in the same lane, opposing each other.

2. The problem with lives forces not moving the same as the notional units. Board controllers attempted to force movement of ground forces by creating gaps and allowing notional units to move through hoping to get the live forces in contact but it failed. The problems of live and notional were much reduced in this exercise.

3. Notional and live forces still mixed on battlefield. Solution: Always lead with live force until penetration effected on live force combat ineffective then pass notional through against pure notional forces on board.

4. Once again it was difficult to accurately portray on the board what was happening on the ground. Difficult to establish who was in control or who was driving who. It seemed the ground was driving their own movements.

5. Bn CO needs to clearly define or redefine who's in charge.

6. Notional units and real units used different FDC's which made it difficult for centralized control.

7. A lack of centralized control of the integrated exercises was noticed. This problem was surfaced previously. The exercise is driven by the ground movement and not by board play. To fully realize the potential of the combined or integrated exercise additional inovations need to be incorporated into the problem. They are: 1) Real or computer attack helicopters played on ground units with attrition. 2) Rear or computer TAC Air played against ground units with attr ion. I feel the exercise could continue to evolve unitl it is an extremely productive training vehicle for staffs, commanders, and individual soldiers.

8. An offensive scenario allows for only limited potential attack helicopter engagements. The integrated format had no real affect on engagement opportunities. Any defense scenario would be better for attack helicopters. "Notional" attack helicopters cannot attack real units. On one occasion a good engagement situation was negated because of this. Attack helicopters would probably have not been allocated against an enemy force as depleted as that in this scenerio. On a relatively small scale exercise such as this this employment of attack helicopters could easily have been handled by one of the ground maneuver players. This is especially true when none of the aviation battalion staff is played and there is no logistical personnel, ammo, or POL play.

9. In this particular exercise we were not permitted to play any air on the field maneuver units, (simulated or otherwise). Recommend in the future that live air be incorporated into the exercise, and the sorties be scored by a field exercise.

10. The real OPFRO must lead the attack rather than merely provide overwatch for 'hotional" units. This is still not a truly integrated exercise.

11. Integration will work at BDE level with the real force (BN) moving within a boundry. This will provide a solution of mixing real with notional.

12. Integration is feasible at a dedicated site, i.e., MTA/NTC. Divisional units cannot be sold this bill of goods to perform with their own assets. Integration should be done only at a Bde level and not at Bn Co level. A Bn zone of action is too fluid and the mixing of notional and live elements occurs too often, to allow realism for MILES or if MILES ran CAMMS then CAMMS would suffer.

13. Mixing of notional and real forces was unrealistic.

14. It was extremely difficult to pass through the real life unit. The controllers were so entwined with "notional vs real" units on the ground, that my team's movement was binded and any maneuver schemes were delayed, becoming less effective. Suggestion: Play the real units as they are, where they are. Place a good map reader with the controller on the ground to give a constant board update as to location, direction of advance and unit strength. This should be available constantly to board players.

15. I thought that the last integrated exercise had shown the need for greater control - tighter coordination by controllers, specifically: between those in the field and those on the board. However, for whatever reasons, this week's exercise proved to be more confusing and frustrating than the initial one. Integrated will simply not happen unless the entire process of notional vs real units is completely thought through. Every possible confrontation must be anticipated and an answer must be immediately given to all "problems."

It is simply much too disturbing to attempt to control a task force anti ghosts - who appear and disappear, depending on the whim, or call of a board OPFOR player.

16. Not realistic for the admin portion to play a number game.

17. Provide some means of integrating overwatch by notional units, even if it's one tank/APC/jeep on the ground. That way, maneuver difficulties would trade with the board and line of sight problems easily resolved.

18. Include questions addressed more specifically to the individual staff section concerning the training benefits and experience with the exercise. Concerning the integrated exercise, there should be a player on the board to reposition the 4.2 mortars, request resupply etc. I recommend that 2 FDC's be operational in the CAMMS building, e.g., 2, 13 personnel that will receive all calls for fire. One net would receive the DS GSR, & GS missing the other would receive all 4.2 and 81mm missions. This would relieve the Bde FSO of this responsibility.

19. ALOG play just isn't real. I think we're learning some bad habits trying to keep up a artificially high consumption rates from computer.

20. Again I must comment. It may be too simplistic and not at all scientific, but, I can tell you intuitively that it won't work as well as other BS's - besides being extremely costly, unrealistic time delays, improbable results from battles, unrealistic constraints (i.e., rate of march while under attack), and many important variables not input.

21. Reports from the company on the ground NONE. Not realistic play with personnel.

22. Once again, Notional/Ground interface.

23. There was a tendency to concentrate attention and efforts, within the staff more to the maneuver unit on the ground rather than equally among those on the CAMMS board and on the lane. Coordination between the unit on the ground and the two on the board with each other and the staff members could have been closer, which would have made the exercise go smoother. Communication was not a problem with the fire support element, however, all fire support should not be on the same net.

24. XO not involved realistically on ground.

Miscellaneous

1. There must have been a problem with the LOOKAHEAD program, either operator headspace or programming error. ALL real units reflected either battle losses or supply degredation; my terminal only put in losses for two units. The program should be looked into to see if BATTLE wasn't being conducted in lieu of BATTLEM.

2. The atrillery play was not realistic, i.e., six rounds from a 8" battalion had no effect on a MRL unit. The response time was OK. The ability to use artillery is good.

3. The kill tables need to be improved. Artillery kills more targets than your computer says. The computer matches real time responsiveness.

4. It was obvious that the Bde staff had not done a physical recon of the training lane. Consequently, the maneuver commander was faced with a lane that the OPFOR had complete control over. It may be realistic, however, it is not condusive to good training. All training lanes should be recon'ed prior to the operations order being prepared.

5. The reason was because there was little new to the mission and plan. The mission should be changed.

6. Bn Cdr and S3 tended to pay more attention to the one team on the ground and neglected the other two. Solution: Keep the Bn Cdr and S3 in the TOC some, require them to be on the notional company ground too.

7. Feedback is always worthwhile. We have made extensive revisions in SOP because of the afteraction discussions.

8. These are some of the major reasons I dislike CAMMS, vice PEGASUS or FIRST BATTLE. The object is to exercise the Bn staff and in this case, a live team on the ground. With the problems outlined above, both objectives were met with considerably less excellence than could be attained using a different vehicle. BOTTOM LINE = CAMMS is nice, not as nice as other BS's, CAMMS is more expensive and less precise than others. And, CAMMS integrated, conceptually look workable, but, is it worth the bucks? I say no. And don't spend the money unless the game rules are well rehearsed and the control staff understands them completely. Don't hear me wrong, everyone concerned is truely professional and sincere. You're just dealing with a format that is far, far less than satisfactory. Thanks - I enjoyed it and learned alot, too. Let's do it next time with PEGASUS.

9. Small problem, but presents confusion. Maneuver unit should have three platoons; one tank, one mech presented the Bn Cdr movement problems, i.e., inadequate firepower during overwatch security for tanks.

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